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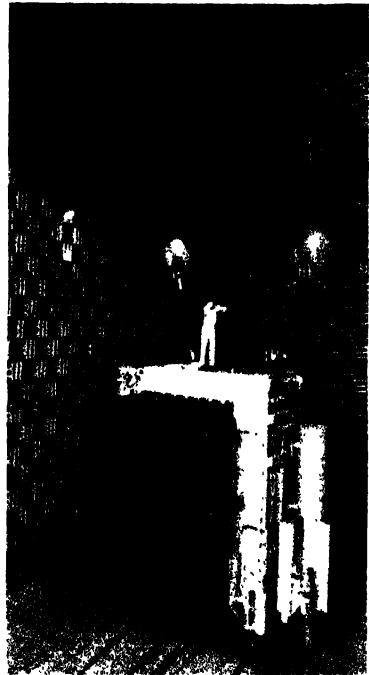
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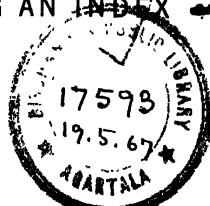
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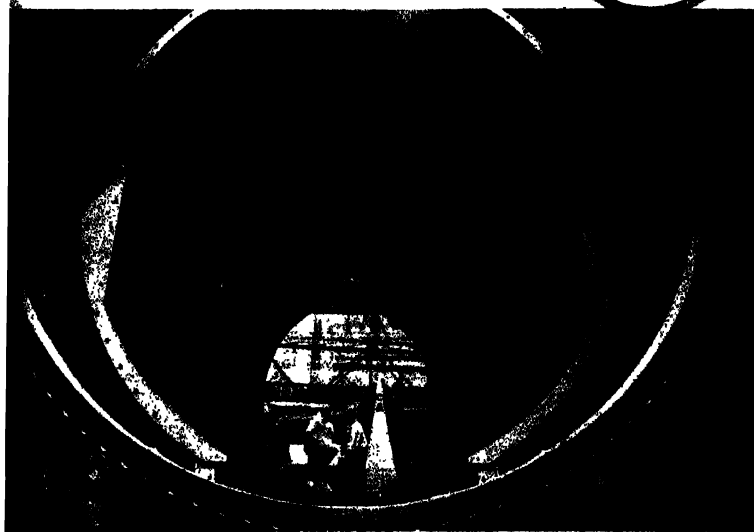
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(LEFT) Anechoic vault of 231,000 cubic feet for making sound measurements on large transformers (Westinghouse). (RIGHT) Housing for a 3600-rpm turbine generator (Westinghouse).

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Addott, Dr Frederick I. *Department of Agronomy University of California at Davis* ABSCISSION

Addison, Dr Cyril Clifford *Nottingham University England* NITROGEN OXIDES

Adler, Dr Edward A. *Department of Microbiology, Yale University* AMINO ACIDS (in part) TRANSAMINATION articles on carbon naturally occurring amino acid

Ahlgren, Dr G. H. *Department of Farm Crops College of Agriculture Rutgers University* FARM CROPS

Ahlstrom, Dr Elbert H. *Laboratory Director U. S. Bureau of Commercial Fisheries* BODILOIDIA MONOCORDATA ROTIFERA SISONACEA

Albert, Dr Henry John *Head of Physics Department Research and Development Division, Ingelhard Industries Inc* PALLADIUM RHODIUM, RUTHENIUM

Albert, Dr Waco W. *College of Agriculture University of Illinois* CATTLE PRODUCTION, BEEF

Alberty, Dean Robert A. *Graduate School, University of Wisconsin* FAST CHEMICAL REACTIONS

Albright, Prof Lyle F. *Professor of Chemical Engineering, Purdue University* NITRATION (in part)

- Albrink, Dr. Wilhelm S. *Professor and Chairman, Department of Pathology, West Virginia University School of Medicine.* INFLAMMATION.
- Alburger, Dr. David E. *Brookhaven National Laboratory.* ISOMERISM; NUCLEAR; MULTIPOLE RADIATION; NUCLEAR SPECTRA.
- Alderfer, Dr. Russell Brunner. *Professor of Soils, Soils Department, College of Agriculture and Environmental Science, Rutgers University.* SOIL (in part).
- Aldrich, Dr. Daniel Gaskill, Jr. *Chancellor, University of California, Irvine.* SOIL (in part).
- Alexopoulos, Prof. Constantine John. *Department of Botany, University of Texas.* FUNGI; MYXOMYCETES; articles on related taxonomic groups.
- Alger, Prof. Philip Langdon. *Adjunct Professor of Electrical Engineering, Rensselaer Polytechnic Institute.* INSULATION, ELECTRIC.
- Alikonis, Justin J. *Director of Research, Paul F. Beich Company.* FOOD MANUFACTURING (in part).
- Allan, Dean William. *School of Engineering and Architecture, City College of the City University of New York.* CHANNEL, OPEN; HYDRAULICS; HYDROMECHANICS; HYDROSTATICS.
- Allen, Paul A. *Physicist, Atmospheric Physics and Chemistry Laboratory, U.S. Weather Bureau.* BROCKEN SPECTER
- Allen, Edward W., Jr. *Chief Engineer, Federal Communications Commission.* BANDWIDTH REQUIREMENTS (COMMUNICATIONS); RADIO SPECTRUM ALLOCATIONS.
- Allen, Eleanor. *Associate Editor Engineering, 'SAE Journal'* TURBINE PROPULSION.
- Allen, Prof. Oscar N. *Professor of Bacteriology, University of Wisconsin.* RHIZOBIAEAE.
- Aller, Dr. Lawrence H. *Professor of Astronomy, University of California, Los Angeles.* ASTROPHYSICS; NEBULA; GASEOUS, other articles on astronomy.
- Allfrey, Prof. Vincent G. *The Rockefeller University.* NUCLEIC ACID; NUCLEOPROTEIN
- Allport, H. Burnham. *National Carbon Company, Division of Union Carbide Chemical Corporation.* ACTIVATED CARBON.
- Allsman, Paul T. *Bureau of Mines, U.S. Department of the Interior.* MINING EXCAVATION.
- Altman, Dr. David. *Division Vice-President, Research and Engineering, United Technology Center.* BORON FUEL; METAL-BASE FUEL.
- Amberson, Dr. William Ruthrauff. *Biologist (retired), Marine Biological Laboratory, Woods Hole, Massachusetts.* PHYSIOLOGY, GENERAL.
- Ammons, Dr. Nelle. *Department of Biology, West Virginia University.* FLOWER (BOTANY); FRUIT (BOTANY); ROOT (BOTANY) - all in part; other articles on botany.
- Amsden, Dr. Thomas W. *Geologist, Oklahoma Geological Survey.* SILURIAN.
- Anderson, Dr. John R. *Assistant Director, Research and Development, Chemicals Division, Union Carbide Corporation.* MOLECULAR WEIGHT.
- Anderson, Dr. Wilhelm. *Director, Foreign Agricultural Analysis Division, Foreign Agriculture Service, U.S. Department of Agriculture.* AGRICULTURE (in part).
- Andrew, Dr. Warren. *Department of Anatomy, Indiana University.* LYMPHATIC SYSTEM (in part).
- Ankeney, D. P. *Aeronautical Research Engineer, U.S. Naval Ordnance Test Station.* SCHLIEREN PHOTOGRAPHY.
- Ankeny, Marling J. *Director, Bureau of Mines, U.S. Department of the Interior.* MINING SAFETY; SAFETY LAMP.
- Anscombe, Prof. Francis John. *Department of Statistics, Yale University.* QUEUEING THEORY.
- Antonides, Lloyd E. *Development Engineer, Fenix and Scisson, Inc.* MINING MACHINERY.

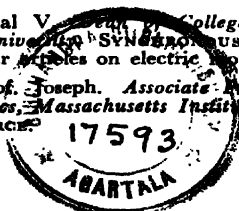
- Apker, Dr. L. *Physicist, General Electric Research Laboratory.* PHOTOCONDUCTIVITY; PHOTOEMISSION; other articles on solid-state physics.
- Appelman, Dr. Evan H. *Argonne National Laboratory.* KRYPTON COMPOUNDS; XENON COMPOUNDS (both in part).
- Applegate, Charles E. *National Research Corporation.* RESISTANCE MEASUREMENTS; other articles on electrical measurements.
- Archer, E. James. *Department of Psychology, University of Wisconsin.* PROBLEM SOLVING (PSYCHOLOGY).
- Arey, Prof. Leslie Brainerd. *Professor emeritus of Anatomy, Northwestern University.* LIP; ORAL GLAND; PALATE; TONGUE.
- Armstrong, Francis Adolf John. *Chemist, Marine Biological Association of the United Kingdom, Plymouth, England.* SEA WATER FERTILITY (in part).
- Arnett, Dr. Ross Harold, Jr. *Department of Biology, The Catholic University of America.* COLEOPTERA.
- Arnold Dr. Chester Arthur. *Professor of Botany and Geology and Curator of Paleobotany, University of Michigan.* ARCHAEOPTERIDALES; CAYTONIALES; NEMATOPHYTALES; PLEUROMETALES.
- Arnold, Prof. James R. *Department of Chemistry, University of California at San Diego.* RADIOACTIVE SPECIES PRODUCED BY COSMIC RAYS.
- Arnstern, Dr. Karl *Vice-President in Charge of Engineering (retired), Goodyear Aircraft Corporation.* AEROSTAT, AIRSHIP; BALLOON. BLIMP; DIRIGIBLE (all in part).
- Aron, Prof. Walter. *Department of Physics, University of Virginia.* ELECTRICITY.
- Artz, Dr. Neal E. *Corn Products Company (retired).* INOSITOL (in part).
- Ash, Col. Simon H. *Consulting Civil and Mining Engineer.* MINING OPERATING FACILITIES (in part).
- Aston, Dr. James. *Consulting Metallurgist (retired), A. M. Beyer Company.* WROUGHT IRON.
- Atkinson, Dr. Robert D'Escourt. *Chief Assistant, Royal Greenwich Observatory, Surrey, England.* CLOCK.
- Atoda, Dr. Kenji. *Professor of Zoology, Tohoku University, Japan.* ANTHROZOA, articles on related taxonomic groups.
- Austin, Prof. James Murdoch. *Associate Professor of Meteorology, Massachusetts Institute of Technology.* WEATHER (FORECASTING AND PREDICTION) --in part.
- Averbach, Prof. B. L. *Department of Metallurgy, Massachusetts Institute of Technology.* HEAT-TREATMENT (METALS AND ALLOYS) --in part.
- Ax, Dr. Albert F. *The Lafayette Clinic.* EMOTION; LIE DETECTOR.
- Ayres, Eugene, *Author of technical books and articles.* ENERGY SOURCES; other articles on sources of energy.
- Ayres, Prof. Quincy Claude. *Former Professor of Agricultural Engineering, Iowa State University.* AGRICULTURE (DRAINAGE).
- B** Babcock, Dr. Horace W. *Director, Mount Wilson and Palomar Observatories.* STELLAR MAGNETIC FIELDS.
- Backstrom, Prof. Gunnar Bengt. *Assistant Professor of Physics, University of Upsala, Sweden.* BETA RAYS; GAMMA RAYS; PAIR PRODUCTION (ELECTRON-POSITRON).
- Bader, Dr. Richard G. *Professor of Oceanography and Meteorology, Agricultural and Mechanical College of Texas.* GULF OF MEXICO.
- Baer, Prof. Charles John. *Department of Mechanical Engineering, University of Kansas.* DRAFTING; ENGINEERING DRAWING (in part); ENGINEERING GRAPHICS (in part); PICTORIAL DRAWING (in part).
- Baer, Dr. Donald R. *Jackson Laboratory, Organic Chemicals Department, E. I. du Pont de Nemours and Company.* ALICYCLIC HYDROCARBON; CYANOCARBON.
- Bagnall, Dr. Kenneth Winfield. *Research Chemist, United Kingdom Atomic Energy Authority.* POLONIUM.

- Bailey, Dr. Reeve M. *Professor of Zoology, University of Michigan*. PISCES (ZOOLOGY); articles on related taxonomic groups.
- Bain, Prof. George W. *Department of Geology, Amherst College*. MINERAL RESOURCE AREAS.
- Baird, Dr. Donald. *Associate Curator of Vertebrate Paleontology, Princeton University*. MESOSAURIA.
- Baker, Dr. Edward W. *Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture*. TROMBIDIFORMES.
- Baker, Prof. William Kaufman. *Professor of Zoology, University of Chicago*. MUTATION.
- Baldwin, Prof. William Marsh, Jr. (Formerly) *Case Institute of Technology*. PLASTIC DEFORMATION OF METAL.
- Bull, Dr. C. Olin. *Professor emeritus, Department of Food Science, Rutgers University*. FOOD ENGINEERING (in part).
- Ballard, Prof. William Whitney. *Department of Biological Science, Dartmouth College*. ESOPHAGUS; PHARYNX.
- Balsley, Dr. James R. *Professor, Wesleyan University, Middleton, Connecticut*. ALROMAGNETIC SURVEYING.
- Banks, Dr. Harlan P. *Professor of Botany, Cornell University*. HYFNIMIES; PSEUDORORNIALES.
- Barer, Dr. Robert. *Professor and Chairman, Department of Human Biology and Anatomy, Sheffield University, England*. MICROSCOPE, INTERFERENCE; MICROSCOPE, PHASE CONTRAST.
- Barghoorn, Prof. Elso S. *Department of Biology, Harvard University*. CORDATALES; NOEGGERATHIALES; PETRIFICATION.
- Barker, Prof. H. A. *Department of Biochemistry, University of California*. BACTERIAL METABOLISM (in part); PROPIONIBACTERIACEAE.
- Barker, Dr. Joseph W. *Chairman of the Board (retired), Research Corporation*. ENGINEERING.
- Barksdale, Prof. Lane. *Department of Microbiology, New York University School of Medicine*. DIPHTHERIA.
- Barnard, Dr. J. Laurens. *Associate Curator of Crustacea, Smithsonian Institution*. AMPHIPODA; GAMMARIDEA.
- Barnes, Dr. Harold. *Senior Principal Scientific Officer, The Scottish Marine Biological Association, Scotland*. UNDERWATER TELEVISION.
- Barnes, Prof. Ralph M. *Professor of Engineering and Production Management, University of California at Los Angeles*. INDUSTRIAL ENGINEERING.
- Barnett, Dr. Roy N. *Associate Clinical Professor of Pathology, Yale University School of Medicine*. HERNIA, KIDNEY DISORDERS; REPRODUCTIVE SYSTEM DISORDERS; URINARY BLADDER DISORDERS.
- Barrington, Prof. Ernest James William. *Department of Zoology, The University, Nottingham, England*. FEEDING MECHANISMS AND DIGESTION.
- Barry, Dr. Alexander. *Professor of Anatomy, Department of Anatomy, University of Michigan*. CARDIOVASCULAR SYSTEM (in part).
- Barstow, John MacDonald. *Bell Telephone Laboratories, Inc.* CLOSED-CIRCUIT TELEVISION.
- Bartels, Prof. Jerome. *Former Professor of Mechanical Engineering, Polytechnic Institute of Brooklyn*. CARNOT CYCLE; REFRIGERATION CYCLE; THERMODYNAMIC CYCLE; other articles on mechanical power.
- Barth, Prof. Tom. F. W. *Professor of Mineralogy, University of Oslo, Norway*. INDEX MINERAL; METAMORPHIC ROCKS; METAMORPHISM; related articles on metamorphic petrology.
- Barton, Dr. Lela V. *Plant Physiologist, Boyce Thompson Institute for Plant Research, Inc., Yonkers, New York*. SEED GERMINATION.
- Barton, Dr. Paul B., Jr. *Geologist, U.S. Geological Survey*. ORE DEPOSITS, GEOCHEMISTRY OF (in part).



- Basolo, Prof. Fred. *Department of Chemistry, Northwestern University.* COMPLEX COMPOUNDS; COORDINATION CHEMISTRY.
- Batchelder, Howard R. *Consulting Chemical Engineer, Battelle Memorial Institute.* FUEL.
- Bateman, Dr. John Burraston. *U.S. Army Biological Laboratories, Fort Detrick, Frederick, Maryland.* CELL MEMBRANES AND MONOLAYERS.
- Bates, Dr. Charles C. *Scientific and Technical Director, U.S. Naval Oceanographic Office, Washington, D.C.* DELTA (in part).
- Battan, Prof. Louis J. *Professor of Meteorology and Associate Director, Institute of Atmospheric Physics, University of Arizona.* LIGHTNING; THUNDER.
- Batten, Dr. Edmund Stanley. *Department of Geophysics and Astronomy, Rand Corporation.* MESOSPHERE; RADAR METEOROLOGY.
- Baumeister, Theodore. *Consulting Engineer, Stevens Professor of Mechanical Engineering, Columbia University; Editor-in-Chief, Marks' Mechanical Engineers' Handbook.* DIESEL ENGINE; ENERGY CONVERSION; POWER PLANT; VALVE; VAPOR CYCLE, other articles on mechanical power.
- Bayer, Dr. Leonard D. *Director (retired), Experiment Station, Hawaiian Sugar Planters' Association.* SORGHUM (in part); SUGAR BEET; SUGAR CANE (in part); SUGAR CROPS.
- Bayley, Dr. Stanley Thomas. *Division of Biosciences, National Research Council of Canada.* CELL WALLS IN PLANTS.
- Beachell, William A. *Consumer and Marketing Service, Grain Division, U.S. Department of Agriculture.* PEA (in part).
- Bear, Dean Richard S. *Graduate College, Boston University.* CYTOLOGY (MOLECULAR BASIS).
- Beard, Robert Gordon. *Instructor in Biology, Swarthmore College.* HEMATOPOIESIS (in part).
- Bearden, Prof. J. A. *Johns Hopkins University.* ATOMIC CONSTANTS; X-UNIT (both in part).
- Beaumont, Dr. Arthur Bishop. *Professor emeritus of Agronomy, University of Massachusetts.* BUCKWHEAT; RAPE, SUNFLOWER.
- Beaumont, Prof. Ross A. *Professor of Mathematics, University of Washington.* DETERMINANT; EQUATIONS, THEORY OF; MATRIX THEORY; other articles on mathematics.
- Beaver, Wallace W. *Director of Research and Development, Brush Beryllium Company.* BERYLLIUM ALLOYS; BERYLLIUM METALLURGY.
- Bechtol, Dr. Charles O. *Division of Orthopedic Surgery, University of California Medical School.* BONE (BIOPHYSICS); PROSTHESIS.
- Beck, Dr. Charles B. *Professor of Botany, University of Michigan.* LEPIDODENDRALES.
- Becken, Eugene Duane. *Vice-President and Chief Engineer, RCA Communications, Inc.* TELEGRAPHY (in part).
- Becker, Dr. Donald Eugene. *Department of Animal Science, University of Illinois.* SWINE PRODUCTION.
- Becker, Prof. Elery R. *Professor of Parasitology, Arizona State University.* SPOROZOA; articles on related taxonomic groups.
- Beckhorn, Dr. Edward John. *Director of Research, Wallerstein Company.* ENZYME (INDUSTRIAL PRODUCTION).
- Beerstecher, Prof. Ernest, Jr. *Professor of Biochemistry, School of Dentistry, University of Texas.* PETROLEUM MICROBIOLOGY.
- Beeson, Dr. Paul Bruce. *Nuffield Professor of Clinical Medicine, University of Oxford.* CYSTITIS; ENDOCARDITIS; FEVER; other articles on medical science.
- Beidler, Prof. Lloyd M. *Professor of Physiology, Florida State University.* CHEMORECEPTION.
- Beistline, Dean Earl Hoover. *Dean, College of Earth Sciences and Mineral Industry, University of Alaska.* MINING, PLACER.

- Belfort, Dr. Alan Michael. *Group Leader, Avicel Laboratory, FMC Corporation, American Viscose Division.* MANNAN (in part).
- Bell, Kenneth E. *Consultant (former Vice-President and Technical Director), A. C. Lawrence Leather Company.* LEATHER AND FUR PROCESSING.
- Bell, Prof. W. Charles. *Professor of Geology, University of Texas.* CAMBRIAN.
- Bender, Prof. Paul J. *Professor of Chemistry, University of Wisconsin.* ACTIVITY (THERMODYNAMICS); FREE ENERGY; THERMODYNAMICS (CHEMICAL); other articles on chemical thermodynamics.
- Benedetti-Pichler, Dr. A. A. (Formerly) *Queens College.* CHEMICAL MICROSCOPY; QUALITATIVE CHEMICAL ANALYSIS; SPOT-TEST ANALYSIS.
- Benedict, Dr. Robert Glenn. *Research Associate Professor, Pharmacognosy, College of Pharmacy, University of Washington.* POLYMYXIN.
- Benfer, Neil A. *Information Scientist, U.S. Coast and Geodetic Survey.* INDEX FOSSIL; SEA STATE, SEA WATER (in part).
- Benner, Dr. Frank C. *National Research Corporation.* VACUUM FUSION.
- Bennett, Dr. H. Stanley. *Department of Anatomy, University of Chicago.* CELL (BIOLOGICAL) - in part.
- Bennett, Dr. Ralph E. *Research Associate, Science Information Section, Squibb Institute for Medical Research.* PENICILLIN; TETRACYCLINE; other articles on antibiotics and on vitamins (co-authored).
- Benton, Prof. George Stock. *Professor of Meteorology, Johns Hopkins University.* HYDROMETEOROLOGY.
- Beranek, Dr. Leo Leroy. *President, Bolt, Beranek and Newman, Inc.* SOUND; WAVE MOTION.
- Berg, Dr. Clyde. *Manager, Design Division, Union Oil Company of California.* SOLIDS PUMP.
- Berger, Dr. France B. *Director, Research Center, General Precision Aerospace, Inc.* DOPPLER RADAR.
- Bergeron, Prof. Tor. *Meteorologiska Institutionen, Uppsala, Sweden.* METEOROLOGY (in part).
- Bergmann, Prof. Peter G. *Professor of Physics, Syracuse University.* CLOCK PARADOX; FOURTH DIMENSION; RELATIVITY (in part); SPACE-TIME.
- Bernhardt, Carl Peter. *Executive Assistant (retired), Industrial Electronics Department, Westinghouse Electric Corporation.* DIELECTRIC HEATING; INDUCTION HEATING.
- Bernheimer, Dr. Alan W. *New York University.* LEUKOCIDIN.
- Bernstein, Dr. Robert Isaac. *Professor of Electrical Engineering and Associate Director, Electronics Research Laboratories, Columbia University.* MOVING-TARGET INDICATION; RADAR; other articles on radar.
- Berson, Prof. Jerome A. *Professor of Chemistry, University of Wisconsin.* ORGANIC REACTION MECHANISM.
- Bethe, Prof. Hans Albrecht. *Laboratory of Nuclear Studies, Cornell University.* MATHEMATICAL PHYSICS; THEORETICAL PHYSICS.
- Bever, Dr. Michael Berliner. *Professor of Metallurgy, Massachusetts Institute of Technology.* METALLOGRAPHY.
- Beverton, Raymond John Heaphy. *Secretary, Natural Environment Research Council, England.* SEA WATER FERTILITY (in part).
- Fewley, Loyal V. *College of Engineering (retired), Lehigh University.* SYNCHRONOUS MOTOR; TRANSIENT, ELECTRIC; other articles on electric motors.
- Bicknell, Prof. Joseph. *Associate Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology.* AERODYNAMIC FORCE.



- Biermann, David J. *Vice-President, Hartzell Propeller, Inc.* PROPELLER, AIR.
- Bigeleisen, Dr. Jacob. *Brookhaven National Laboratory.* DEUTERIUM.
- Bikales, Dr. Norbert M. *Research Chemist, American Cyanamid Company.* CYANOETHYLATION.
- Billingham, Dr. Rupert Everett. *Professor and Chairman, Department of Medical Genetics, University of Pennsylvania School of Medicine, and Professor of Zoology, University of Pennsylvania.* INTIGUMENT (in part).
- Billings, Dr. Bruce Hadley. *Baird-Atomic, Inc.; Harvard College Observatory.* CRYSTAL OPTICS; INTERFERENCE OF WAVES; POLARIZED LIGHT; other articles on physical optics.
- Billings, Dr. W. D. *Professor of Botany, Duke University.* ECOLOGY, PHYSIOLOGICAL.
- Billington, Dr. Douglas Sheldon. *Director, Solid State Division, Oak Ridge National Laboratory.* RADIATION DAMAGE (INANIMATE MATERIALS).
- Billmeyer, Dr. Fred W., Jr. *Department of Chemistry, Rensselaer Polytechnic Institute.* SCATTERING (ELECTROMAGNETIC RADIATION), ULTRAVIOLET RADIATION.
- Bing, Prof. R. H. *Department of Mathematics, University of Wisconsin.* SET THEORY.
- Birkhoff, Garrett. *Professor of Pure and Applied Mathematics, Harvard University.* BOOLEAN ALGEBRA; LATTICE (MATHEMATICS).
- Bishop, Dr. David W. *Research Professor of Embryology, Carnegie Institution of Washington.* FERTILIZATION.
- Black, Dr. Harold S. *Principal Research Scientist, General Precision Aerospace, Inc.* AMPLITUDE MODULATION; FREQUENCY MODULATION; PULSE MODULATION; other articles on communications.
- Black, Dr. John D. *Professor of Zoology, Missouri Teachers College.* Series of articles on zoology.
- Black, Dr. L. M. *Department of Botany, University of Illinois.* PLANT VIRUS.
- Black, Prof. Paul H. *Department of Mechanical Engineering, Ohio University.* HARMONIC SPEED CHANGER; MACHINE KEY, ROPE; TOLERANCE; other articles on machine design.
- Black, Prof. Robert F. *Department of Geology, University of Wisconsin.* FRONT AGE ON; PERMAFRONT.
- Blatt, Dr. John E. *Head, Department of Microbiology, The Roosevelt Hospital, New York.* GAFFKYA TETRAGENA; STAPHYLOCOCCUS.
- Blair, Dr. W. Frank. *Professor of Zoology, University of Texas.* COMMUNITY CLASSIFICATION.
- Blake, David K. *Consultant (retired), General Electric Company.* ELECTRIC DISTRIBUTION SYSTEMS.
- Blanc, Milton L. *Research Climatologist, Field Research Coordinator, Office of Climatology, U.S. Weather Bureau.* AGRICULTURAL METEOROLOGY (in part); GROWING SEASON.
- Blanchard, Dr. Duncan Cromwell. *Woods Hole Oceanographic Institution.* SEA WATER (in part).
- Blankenship, Dr. Forrest F. *Reactor Chemistry Division, Oak Ridge National Laboratory.* FUSEL-SALT PHASE EQUILIBRIA (in part).
- Blaser, H. Weston. *Associate Professor of Botany, University of Washington.* BARK; PERIDERM; PITH.
- Blatt, Dr. Frank J. *Associate Professor of Physics, Michigan State University.* BOLTZMANN TRANSPORT EQUATION; FREE-ELECTRON THEORY OF METALS; HALL EFFECT; other articles on solid-state physics.
- Blew, J. Oscar, Jr. *Head of Section on Preservative Treatment, U.S. Forest Products Laboratory.* WOOD PRESERVATION.
- Blizard, Everitt P. *Director, Neutron Physics Division, Oak Ridge National Laboratory.* RADIATION SHIELDING.

- Blum, Dr. William. National Bureau of Standards (retired).*  
ELECTROPLATING OF METALS.
- Blumenstock, Dr. David L. Climatologist, U.S. Weather Bureau.*  
CLIMATIC PREDICTION; CLIMATOLOGY.
- Blumenthal, Prof. Leonard M. Professor of Mathematics, University of Missouri.* ANALYTIC GEOMETRY; LOGIC; PROJECTIVE GEOMETRY; other articles on geometry.
- Boardman, Dr. Horace P. Professor emeritus of Civil Engineering, University of Nevada.* SNOW GAGE; SNOW SURVEYING.
- Boast, Dr. Warren B. Head, Department of Electrical Engineering, Iowa State University.* ILLUMINATION; LIGHT AMPLIFIER; LIGHT PANEL; LUMINAIRE.
- Bocciarelli, Carlo V. Associate Director of Research, Philco Corporation.* PARAMETRIC AMPLIFIER.
- Bochner, Dr. Salomon. Henry Burchard Fine Professor of Mathematics, Princeton University.* MATHEMATICS.
- Boden, Dr. Brian Peter. Assistant Research Biologist, Scripps Institution of Oceanography, University of California.* EUPHAUSIACEA.
- Bodian, Dr. David. Professor and Director, Department of Anatomy, Johns Hopkins University School of Medicine.* NERVOUS SYSTEM (in part).
- Bocll, Prof. Edgar John. Department of Biology, Yale University.* ANIMAL GROWTH.
- Bohonos, Dr. Nestor. Lederle Laboratories Division, American Cyanamid Company.* CHLORTETRACYCLINE.
- Boisvert, Dr. Paul L. Research Associate; Director of Disease Laboratory, Yale School of Medicine; Attending Pediatrician, Grace-New Haven Community Hospital.* LANCEFIELD DIFFERENTIATION SCHEME; RHEUMATIC FEVER; STREPTOCOCCUS; other articles on medical science.
- Boke, Dr. Norman H. Research Professor of Botany, University of Oklahoma.* EPIDERMIS, PLANT; MERISTEM, APICAL; SCIENERGHYMA.
- Bolz, Dr. Ray E. Leonard S. Case Professor and Head of Engineering, Case Institute of Technology.* NUTATION (ASTRONOMY AND MECHANICS); POINSON'S METHOD; PRECESSION, RIGID-BODY DYNAMICS.
- Bondurant, Donald C. U.S. Army Engineers Division, Missouri River (Sediment Investigations Section).* REVETMENT; RIVER ENGINEERING (both in part).
- Bonn, George S. Professor of Library Studies, University of Hawaii.* LITERATURE OF SCIENCE AND TECHNOLOGY.
- Bonner, Walter D., Jr. Professor of Physical Biochemistry and Plant Physiology, University of Pennsylvania.* CELL (BIOLOGICAL), SPECTRAL ANALYSIS OF.
- Borcherdt, E. R. Borcherdt and Smith Mining Consultants.* MINING, UNDERGROUND.
- Borthwick, Dr. Harry Alfred. Crops Research Division, U.S. Department of Agriculture.* PHOTOPERIODISM IN PLANTS.
- Boston, Orlan William. Professor emeritus, College of Engineering, University of Michigan.* ELECTRIC-DISCHARGE MACHINING; MACHINABILITY (METALS); ULTRASONIC MACHINING.
- Boswell, Dr. Victor R. Horticulturist, U.S. Department of Agriculture.* MELON GROWING; articles on various melons.
- Botset, Prof. Holbrook G. Professor of Petroleum Engineering, University of Pittsburgh.* PHOTOCINOMETER.
- Bouton, George M. Bell Telephone Laboratories, Inc.* SOLDERING.
- Bovell, Carlton Rowland. Associate Professor of Microbiology, University of California, Riverside.* METHANOMONADACEAE (in part).
- Bowden, W. C. Vice-President (retired), Ledoux and Company.* ASSAYING (in part).

- Bower, Frank H.** *Engineering Coordinator, Sylvania Semiconductor Division.* THERMISTOR.
- Bowles, Oliver.** *Former Consultant in Mining Engineering.* QUARRYING; STONE AND STONE PRODUCTS.
- Bowman, Dean Harry Lake.** *Drexel Institute of Technology.* STRUCTURAL ANALYSIS; STRUCTURAL DEFLECTION; TRUSS.
- Bowman, Richard George.** *Technical Assistant to the President, Republic Aviation Corporation.* AIRCRAFT; STREAMLINING; TAIL ASSEMBLY.
- Bowman, Rush A.** *Consulting Engineer, Rush A. Bowman and Associates.* COMPARATOR; GAGES; OPTICAL FLAT.
- Bowman, Dr. Thomas E.** *Associate Curator, Division of Crustacea, Smithsonian Institution.* FIABELLIFERA; HYPLIRIDEA; PERACARIDA.
- Boyd, Prof. Edward Allen.** *Department of Biological Structure, University of Washington School of Medicine.* GALLBLADDER.
- Bozorth, Dr. Richard Milton.** *Research Physicist, International Business Machines and Naval Ordnance Laboratory.* FERRITE; MAGNETIC MATERIALS; other articles on magnetic materials.
- Bradley, Charles Byron.** *Johns Manville Research and Engineering Center (retired).* INSULATION, FLAT.
- Bradley, Dr. William Frank.** *Professor of Chemical Engineering, University of Texas.* ASBESTOS; SLPOLITE; SERPENTINE.
- Bradner, Mead.** *Manager, Research and Development, The Foxboro Company.* FLOW MEASUREMENT (in part).
- Bradsher, Dr. Charles Kilgo.** *Professor of Chemistry, Duke University.* AROMATIC HYDROCARBON, BENZENE, FRIEDEL-CRAFTS REACTION; other articles on aromatic hydrocarbons.
- Bland, Dr. Louis M. D.** *Anderson Professor of Mathematics, University of Houston.* BARYCENTRIC CALCULUS; MATRIX CALCULUS; PROGRESSION (MATHEMATICS); other articles of mathematics.
- Branson, Dr. Carl C.** *School of Geology and Oklahoma Geological Survey, University of Oklahoma.* BLACK SHALE; DARGY; REDBELL.
- Brattstrom, Dr. Bayard H.** *Assistant Professor of Biology, Orange County State College, California.* LEPTOSAURIA.
- Bredig, Dr. Max A.** *Associate Director, Chemistry Division, Oak Ridge National Laboratory.* FUSED-SALT PHASE EQUILIBRIA (in part).
- Bieger, Dr. Irving Arthur.** *U.S. Geological Survey.* ASPHALT AND ASPHALTITE (in part); GILSONITE; OIL SHALE; other articles on petroleum geology.
- Breit, Prof. Gregory.** *Donner Professor of Physics, Yale University.* SCATTERING EXPERIMENTS, NUCLEAR.
- Bretz, Prof. J. Harlan.** *Department of Geophysical Sciences, University of Chicago.* CAVE; KARST TOPOGRAPHY.
- Bricker, Prof. Clark E.** *Department of Chemistry, University of Kansas.* TITRATION; VOLUMETRIC ANALYSIS; other articles on volumetric analysis.
- Brickley, Robert L.** *Manager, Quality Assurance Department, Semiconductor Department, Westinghouse Electric Corporation.* ANALYSIS OF VARIANCE.
- Bridgman, Prof. Percy Williams.** *(Formerly) Harvard University.* HIGH-PRESSURE PHYSICS; SCIENCE, SCIENTIFIC METHODS; other articles on logic.
- Brigham, Harry Straight.** *Executive Vice-President, Dixilyn Corporation.* OIL AND GAS WELLS (in part).
- Bright, Prof. James Rieker.** *Graduate School of Business Administration, Harvard University.* AUTOMATION.
- Brimm, Dr. Eugene O.** *Assistant Manager, Research Linde Company, Division of Union Carbide Corporation.* METAL CARBONYL.
- Brindley, Dr. George W.** *Professor of Solid State Technology, Materials Research Laboratory, and Department of Geochemistry and Mineralogy, Pennsylvania State University.* APOPHYLLITE; TALC.

- Brinton, Dr. Edward. *Scripps Institution of Oceanography*. SEA WATER FERTILITY (in part).
- Brockway, Prof. Lawrence O. *Chemistry Department, University of Michigan*. ELECTRON DIFFRACTION (in part).
- Brodersen, Prof. Dr. Klaus. *Professor of Inorganic and Analytical Chemistry, University of Erlangen-Nürnberg, Germany*. MERCURY (ELEMENT).
- Brodhag, Dr. Alex Edgar, Jr. *Associate Editor, Applied Organic Editing Department, Chemical Abstracts Service*. FURFURAL; SCHIFF BASE.
- Brodsky, Prof. William A. *Professor of Experimental Medicine, University of Louisville School of Medicine*. OSMOREGULATORY MECHANISMS.
- Broecker, Prof. Wallace S. *Department of Geology, Columbia University*. LOW-LEVEL COUNTING; RADIOCARBON DATING.
- Brombacher, Dr. William George. *Mechanical Engineer (retired), National Bureau of Standards*. ACCELERATION MEASUREMENT; AIRCRAFT INSTRUMENTATION; TIME-INTERVAL MEASUREMENT; other articles on instrumentation.
- Bromley, Prof. D. Allan. *Professor of Physics and Director of Nuclear Structure Laboratory, Yale University*. JUNCTION DETECTOR.
- Bronfenbrenner, Urie. *Professor of Child Development and Family Relationships, Cornell University*. INTELLIGENCE.
- Brooke, Dr. M. M. *Chief, Microbiology Section, Communicable Disease Center, U.S. Public Health Service; Associate Professor of Parasitology, Emory University College of Medicine*. PROTOZOA; TRYPANOSOMATIDAE.
- Brooks, Dr. Reid M. *Professor, Department of Pomology, University of California*. FRUIT (BOTANY)—in part.
- Brooks, Stanley Nelson. *Research Agronomist, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture*. HOP.
- Brouwer, Prof. Dirk. *Director, Observatory, Yale University*. ANTIGRAVITY; GRAVITATION; GRAVITY.
- Brower, Prof. William B., Jr. *Department of Aeronautical Engineering, Rensselaer Polytechnic Institute*. ELECTROLYTIC TANK.
- Brown, Prof. Frank Arthur, Jr. *Morrison Professor of Biology, Northwestern University*. PERIODICITY IN ORGANISMS, SIPUNCULOIDEA.
- Brown, Prof. Frederick C. *Department of Physics, University of Illinois*. COLOR CENTERS; PHOTOLYSIS (PHOTOCHEMISTRY).
- Brown, Dr. Harold. *Director of Defense Research and Engineering, U.S. Department of Defense*. NUCLEAR EXPLOSION (in part).
- Brown, Prof. Harold W. *College of Physicians and Surgeons, Columbia University*. STRONGYLOIDEA.
- Brown, Dr. Henry. *Research Director, Udylyte Corporation*. CADMIUM.
- Brown, Lawrence S. *Business Manager, Grumman Aircraft Engineering Corporation*. BALLISTIC MISSILE; GUIDED MISSILE.
- Brownell, Dr. Gordon Lee. *Associate Professor, Massachusetts Institute of Technology; Applied Physicist, Massachusetts General Hospital*. IRRADIATION, ISOTOPIC; ISOTOPE DILUTION TECHNIQUES; RADIOACTIVITY (APPLICATIONS); TRACER, RADIOACTIVE.
- Broyer, Theodore Clarence. *Professor of Plant Physiology and Plant Physiologist in the California Agricultural Experiment Station, Department of Soils and Plant Nutrition, University of California*. FERTILIZING (in part); HYDROPONICS.
- Bruhn, Prof. Hjalmar D. *Agricultural Engineering Department, University of Wisconsin*. AGRICULTURAL SOIL AND CROP PRACTICES (in part).
- Bruner, Prof. Jerome Seymour. *Professor of Psychology, Harvard University*. ABNORMAL BEHAVIOR; FREUDIANISM, PERSONALITY THEORY; other articles on neuroses (all co-authored).

- Bryan, Prof. Leslie Aulls. *Director, Institute of Aviation; Professor of Management, University of Illinois.* AIR TRANSPORTATION; AIRCRAFT, MILITARY; AVIATION.
- Bryson, Prof. Arthur Earl, Jr. *Harvard University.* EULER'S MOMENTUM THEOREM; FLUID-FLOW PRINCIPLES; KARMAN VORTEX STREET; other articles on fluid mechanics.
- Buchwald, Dr. Niels Fabritius. *Professor in Plant Pathology, The Royal Veterinary and Agricultural College, Copenhagen, Denmark.* FUNGI IMPERFECTI; articles on related taxonomic groups.
- Buck, Dr. Dudley A. (Formerly) *Department of Electrical Engineering, Massachusetts Institute of Technology.* CRYOTRON.
- Buckley, Donald J. *Senior Research Associate, Esso Research and Engineering Company.* COHESION (PHYSICS)—in part.
- Budlong, A. L. *Secretary and General Manager, American Radio Relay League, Inc.* AMATEUR RADIO.
- Buechner, Prof. William Weber. *Professor of Physics, Massachusetts Institute of Technology.* BARN (UNIT); NUCLEAR RADIATION; NUCLEAR REACTION; SPALLATION REACTION.
- Buettner, Dr. Konrad J. K. *Departments of Atmospheric Sciences and of Dermatology, University of Washington.* BIOCLIMATOLOGY.
- Bullen, Prof. Keith Edward. *Professor of Applied Mathematics, University of Sydney, Australia.* EARTH INTERIOR.
- Bullington, Kenneth. *Transmission Systems Engineer, Bell Telephone Laboratories, Inc.* RADIO-WAVE PROPAGATION.
- Bullock, Prof. Theodore H. *Department of Zoology, University of California, Los Angeles.* HEART (GANGLIONIC PACEMAKER); HEMI-CHORDATE; articles on related taxonomic groups.
- Bunker, Maj. Gen. William B. *U. S. Army.* HELICOPTER.
- Bunnett, Dr. Joseph F. *Professor of Chemistry, Brown University.* SUBSTITUTION REACTION, other articles on organic reaction mechanisms.
- Burbidge, Dr. E. Margaret. *Professor, University of California at San Diego.* ELEMENTS AND NUCLEIDES (ORIGIN).
- Burchard, Kenneth R. *Director of Evening Classes and Summer Session, School of Printing Management, Carnegie Institute of Technology.* PRINTING IN COLOR.
- Burrows, Prof. William. *Professor of Microbiology, University of Chicago.* CHOLERA VIBRIO.
- Burner, Prof. Evers. *Associate Professor emeritus of Naval Architecture and Marine Engineering, Massachusetts Institute of Technology.* MARINE ENGINE.
- Burton, Dr. Milton. *Professor of Chemistry; Director, Radiation Laboratory, University of Notre Dame.* RADIATION CHEMISTRY.
- Burton, Dr. Ralph A. *Staff Scientist, Southwest Research Institute.* ICE POINT; TEMPERATURE, THERMAL EXPANSION.
- Burwell, Prof. Robert I., Jr. *Professor of Chemistry, Northwestern University.* CATALYSIS.
- Busch, Prof. Daryle H. *Department of Chemistry, Ohio State University.* CHEMICAL STRUCTURES; CRYSTAL FIELD THEORY; NONSTOICHIOMETRIC COMPOUNDS; SOLID-STATE CHEMISTRY.
- Butler, Prof. Elmer Grimes. *Henry Fairfield Osborn Professor of Biology, Princeton University.* REGENERATION (BIOLOGY).
- Eutts, Prof. Allison. *Professor emeritus of Metallurgy, Lehigh University.* COPPER.
- Butz, J. S., Jr. *'Air Force Magazine.'* FUSELAGE.
- Byerly, Prof. Perry. *Director emeritus of Seismographic Stations; Professor emeritus of Seismology, University of California.* EARTHQUAKE.
- Cable, Prof. Raymond Millard. *Professor of Zoology, Department of Biological Sciences, Purdue University.* CERCARIA; DIGENEA.
- Cady, Dr. Gilbert Haven. *Head emeritus of Coal Division, Illinois State Geological Survey.* COAL; LIGNITE; PEAT.
- Cain, Prof. Stanley A. *Charles Lathrop Pack Professor of Conservation and Chairman of Conservation Department, University of Michigan.* CLIMAX PLANT FORMATIONS; CONSERVATION OF RESOURCES.

- Caley, Prof. Earle Radcliffe. *Department of Chemistry, Ohio State University*. ARCHEOLOGICAL CHEMISTRY; CHEMICAL DATING.
- Calhoun, Dr. John C., Jr. *Vice-President for Programs, Texas A and M University System*. OIL AND GAS STORAGE; PETROLEUM SECONDARY RECOVERY.
- Callaway, Dr. Joseph. *Department of Physics, University of California, Riverside*. BAND THEORY OF SOLIDS; BRILLOUIN ZONE; COHESION (PHYSICS)—in part; other articles on band structure in solids.
- Cambel, Dr. Ali Bulent. *Professor and Chairman of Mechanical Engineering and Astronautical Sciences, Northwestern University*. GAS DYNAMICS.
- Cameron, Donald B. *Manager, Sales Engineering, Union Carbide Consumer Products Company*. SOLID.
- Camilli, Guglielmo C. *Supervisor, Advance Development Engineering, General Electric Company*. INDUCTION COIL.
- Camin, Dr. Joseph H. *Department of Zoology, University of Maryland*. MESOSTIGMATA; ONYCHOPALPIDA.
- Cammack, R. L. *Manager, Plant Services Department, Westinghouse Corporation*. JIG, FIXTURE, AND DIE DESIGN.
- Camp, Prof. Charles Lewis. *Department of Paleontology, University of California*. ICHTHYOPTERYGIA; ICHTHYOSAURIA.
- Cannon, Prof. Robert Hamilton, Jr. *Department of Aeronautics and Astronautics, Stanford University*. AUTOPILOT; GYROSCOPE; articles on navigation instruments and guidance systems.
- Carew, Dr. John. *Professor of Horticulture, Michigan State University*. VEGETABLE GROWING; series of articles on edible plants.
- Carlin, Dr. Robert B. *Becker Professor of Organic Chemistry, Carnegie Institute of Technology*. PHENOL; other articles on phenols.
- Carone, Dr. Frank A. *Associate Professor, Department of Pathology, Northwestern University Medical School*. ANEURYSMS; CARDIOVASCULAR SYSTEM DISORDERS.
- Carpenter, Dr. Charles M. *University of California School of Medicine*. GONORRHEA; GRAM-NEGATIVE DIPLOCOCCI; MENINGOCOCCUS.
- Carpenter, Prof. Frank Morton. *Department of Biology, Harvard University*. INSECTA FOSSILS.
- Carritt, Dr. Dayton Ernest. *Massachusetts Institute of Technology and Woods Hole Oceanographic Institution*. SEA WATER (in part).
- Carroll, Phil. *Professional Engineer*. WAGE INCENTIVES.
- Carson, Robert William. *Product Engineering*. CLADDING; METAL INSPECTION; MAGNETIC.
- Carter, Archie Newton. *President, Carter, Krueger, and Associates, Inc.* HIGHWAY ENGINEERING; PAVEMENT; TRAFFIC ENGINEERING; TRANSPORTATION ENGINEERING.
- Carter, Dr. George S. *Fellow of Corpus Christi College; Lecturer in Zoology, Cambridge University, England (retired)*. MACROEVOLUTION.
- Carter, Prof. Herbert E. *Department of Chemistry and Chemical Engineering, University of Illinois*. CETYL ALCOHOL; GLYCOLIPID; LIPID (all in part); other articles on lipids (co-authored).
- Caspari, Dr. Ernest W. *Department of Biology, University of Rochester*. CYTOPLASMIC INHERITANCE; MATERNAL INFLUENCE.
- Caspers, Prof. Dr. Hubert. *Head, Hydrobiological Department, Zoologisches Staatsinstitut, Germany*. BLACK SEA.
- Cave, Dr. Genille C. B. *Department of Chemistry, McGill University, Canada*. FORENSIC CHEMISTRY.
- Chace, Dr. Fenner Albert, Jr. *Senior Scientist, Department of Invertebrate Zoology, Smithsonian Institution*. DECAPODA (CRUSTACEA).
- Chamberlain, Dr. Joseph W. *Associate Director (Space Division), Kitt Peak National Observatory, Tucson*. AURORA.



- Chandler, Richard F. *Mechanical Engineer, Air Force Missile Development Center, Holloman Air Force Base, New Mexico.* SHADOWGRAPH OF FLUID FLOW.
- Chaney, Dr. Ralph W. *Department of Paleontology, University of California.* PALEOBOTANY (in part).
- Chang, Prof. M. C. *Worcester Foundation for Experimental Biology and Department of Biology, Boston University.* REPRODUCTIVE SYSTEM (in part).
- Chao, Dr. Edward C. T. *U.S. Geological Survey.* GYPSUM, other articles on sulfate and related minerals.
- Chapman, Prof. Carleton A. *Professor of Geology, University of Illinois.* IGNEOUS ROCKS; MAGMA; PETROGRAPHIC PROVINCE; series of articles on igneous petrology.
- Chapman, Dr. Sydney. *Advisory Scientific Director, Geophysical Institute, University of Alaska; Member of Research Staff, High Altitude Observatory, Boulder, Colorado.* GEOMAGNETIC STORM; GEOMAGNETIC VARIATIONS, TRANSIENT; GEOMAGNETISM.
- Charlton, Dr. Ernest E. *Research Engineer (retired).* X-RAY TUBE.
- Charney, Prof. Jule G. *Department of Meteorology, Massachusetts Institute of Technology.* WEATHER (FORECASTING AND PREDICTION) in part.
- Chase, Prof. Herman Burleigh. *Biology Department, Brown University.* HAIR.
- Cheadle, Prof. Vernon Irvin. *Professor of Botany, University of California.* MERISTEM, LATERAL, PERICYCLE; PHLOEM; XYLEM.
- Cheatham, Dr. Alan H. *Instructor in Geology, Louisiana State University.* CENOZOIC; articles on related divisions of geologic time (co-authored).
- Chellis, Robert Dunning. *Consulting Structural Engineer.* CAISSON FOUNDATION, FOUNDATIONS; PILE FOUNDATIONS; related articles on civil engineering.
- Chen, Dr. Shih-Yuan. *Chief, Aerothermodynamics Unit, Aerospace Division, Boeing Airplane Company.* AEROTHERMODYNAMICS; HYPERSONIC FLIGHT; THERMAL STRESS.
- Chenault, Roy Lee. *Chief Research Engineer, Oilwell Division, U.S. Steel Corporation.* OIL AND GAS FIELD EXPLOITATION.
- Chernow, Dr. Marvin A. *Clinical Instructor, Pathology, Yale School of Medicine; Director of Laboratories, Newport Hospital.* HEART DISORDERS.
- Chew, Frank. *Research Assistant Professor, The Marine Laboratory, University of Miami.* GULF OF MEXICO (in part).
- Chew, Prof. Geoffrey F. *Department of Physics, University of California, Berkeley.* SCATTERING (NUCLEAR) DISPERSION RELATIONS.
- Chickering, Dr. Arthur Merton. *Professor emeritus, Albion College.* ARANEAE.
- Childberg, Guy Lewis. *Outside Plant Engineer, American Telephone and Telegraph Company.* TELEPHONE SYSTEMS CONSTRUCTION.
- Chilton, Dr. St. John P. *Department of Botany, Louisiana State University.* RICE; SUGAR CANE (both in part).
- Chitwood, Dr. Benjamin Goodwin. *Laboratory of Comparative Biology, Kaiser Foundation Research Institute.* NEMATODA.
- Chow, Dr. Kao Liang. *Division of Neurology, Stanford Medical School.* SENSORY LEARNING.
- Christ, Dr. C. L. *Physicist, U.S. Geological Survey.* BORACITE; BORATE MINERALS; KERNITE.
- Christensen, Dr. Clyde M. *Professor of Plant Pathology, University of Minnesota.* PLANT DISEASE (in part).
- Christensen, Dr. J. J. (Formerly) *Institute of Agriculture, University of Minnesota.* BARLEY; CORN; FLAX; WHEAT (all in part).
- Chute, Challoner Richard. *General Aniline and Film Corporation, Central Research Laboratory.* FIBER, NATURAL; TEXTILE CHEMISTRY

- Clapp, Prof. Leallyn B. *Chemistry Department, Brown University.* AMINE; OXIME; other articles on organonitrogen compounds.
- Clapp, Philip Fanshawe. *U.S. Department of Commerce, Weather Bureau.* WEATHER; WEATHER MAP.
- Clark, Prof. George L. *Research Professor emeritus of Analytical Chemistry, University of Illinois.* MICROPHONE, X-RAY; X-RAY(S), PHYSICAL NATURE OF; X-RAY OPTICS.
- Clark, Dr. Kenneth G. *Fertilizer Investigations Research Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture.* FERTILIZER.
- Clark, Pearl F. (Mrs. Wallace). *Honorary Director, Wallace Clark Center of International Management, New York University.* GANTT CHART.
- Clark, Dr. Sam Lillard. *Former Professor of Anatomy and Head of Department, Vanderbilt University Medical School.* NERVOUS SYSTEM (in part).
- Clark, Prof. Sydney P., Jr. *Professor of Geology, Yale University.* EARTH (HEAT FLOW).
- Clark, Dr. Walter. *Research Laboratories, Eastman Kodak Company.* CAMERA; PHOTOGRAPHY; PHOTOGRAPHY, COLOR; other articles on photography.
- Clark, William Petzold. *Wall Colmonoy Corporation.* METAL COATINGS (in part).
- Clarke, Ellen. *Columbia Organic Chemical Company.* HALOFORM REACTION; HALOGENATED HYDROCARBON (in part).
- Clarke, Dr. George Leonard. *Associate Professor of Biology, Harvard University, and Marine Biologist, Woods Hole Oceanographic Institution.* MICRORADIOGRAPHY (in part); RADIOGRAPHY, SEA WATER (in part).
- Clarke, Dr. J. Harold. *Horticulturist, Clarke Nursery, Long Beach, Washington.* FRUIT GROWING (SMALL); series of articles on fruits.
- Clarke, John H. *Engineering Design Supervisor, Air Conditioning and Power, Food Products Division, Union Carbide Corporation.* VENTILATION.
- Clarridge, Ralph Ernest. *Engineering Planning, Control I/O Development, Systems Development Division, IBM.* LEVEL MEASUREMENT; TEMPERATURE MEASUREMENT; WEIGHT MEASUREMENT; articles on various measuring instruments.
- Clausen, Dr. Harry J. *Career Development Review Branch, Division of Research Grants, National Institutes of Health.* PINEAL BODY.
- Claussen, Dr. Gerard E. *Director of Research, Hobart Brothers Company, Troy, Ohio.* WELDING AND CUTTING OF METALS.
- Clayton, James Monroe. *Advisory Engineer, Westinghouse Electric Corporation.* ELECTRIC PROTECTIVE DEVICES; GROUNDING, ELECTRICAL.
- Clayton, Dr. Roderick K. *Senior Investigator, C. F. Kettering Research Laboratory, Yellow Springs, Ohio.* BACTERIAL MOTILITY.
- Clemence, Dr. Gerald M. *Scientific Director, U.S. Naval Observatory.* ASTRONOMICAL COORDINATE SYSTEMS; CALENDAR; TIME; other articles on astronomy.
- Clemens, Dr. William A. *Associate Curator, Museum of Natural History, University of Kansas.* PANTOTHERIA; other articles on fossil mammals.
- Clement, Prof. Anthony C. *Department of Biology, Emory University.* CELL LINEAGE.
- Clements, Dr. Leo. P. *Professor emeritus of Anatomy, Creighton University School of Medicine.* RESPIRATORY SYSTEM (in part).
- Clements, Dr. Thomas. *Consulting Geologist.* DESERT EROSION FEATURES; DUNE (in part); PLAYA.
- Clench, Dr. William James. *Curator of Mollusks, Museum of Comparative zoology, Harvard University.* MOLLUSCA; articles on related taxonomic groups.

- Cleveland, Prof. Laurence Fuller. *Professor of Electrical Engineering, Northeastern University.* DIRECT-CURRENT MOTOR; DYNAMIC BRAKING.
- Cloud, Dr. Preston E., Jr. *U.S. Geological Survey* CORAL REEF; REEF; other articles on types of reefs.
- Cobban, Dr. William Aubrey. *Geologist, U.S. Geological Survey.* CRETACEOUS; MESOZOIC.
- Cobine, Dr. James Dillon. *General Electric Research Laboratory.* GAS TUBE; THYRATRON; VOLTAGE-REGULATOR TUBE.
- Cochran, David. *General Electric Company, Defense Programs Division.* JET PROPULSION; PROPULSION.
- Cochrane, Prof. John D. *Associate Professor, Department of Oceanography, Texas A and M University* SEA WATER (in part).
- Code, Prof. Charles Frederick. *Mayo Foundation and Mayo Clinic.* DIGESTIVE SYSTEM (in part).
- Coggeshall, Dr. Ivan S. *Assistant Vice-President (retired), Western Union Telegraph Company.* TELEGRAPHY (in part).
- Cohart, Prof. Edward Maurice. *Department of Public Health, Yale University School of Medicine* PUBLIC HEALTH.
- Cohen, Charles A. *Research Associate, Esso Research and Engineering Company.* ADDITION REACTION, 1,5-CYCLOOCTADIENE; DIENES; UNSATURATED HYDROCARBONS; other articles on unsaturated hydrocarbons.
- Cohen, Richard L. *Member of Technical Staff, Bell Telephone Laboratories.* MÜSSBAUER EFFECT.
- Cole, Prof. LaMont C. *Department of Zoology, Cornell University* POPULATION DYNAMICS.
- Cole, Marc. *Senior Chemist, Production and Development, Hoffmann-LaRoche, Inc.* VITAMIN B<sub>6</sub> (in part).
- Cole, Dr. W. Storrs. *Professor of Geology and Chairman of Department, Cornell University.* NUMMULITES.
- Coleal, Ernest. *Assistant for Facilities Development, Flight Research Division, Air Force Flight Test Center, Edwards Air Force Base, California* ROCKET-SEED TESTING.
- Coleman, Dr. Donald G. *Chief, Research Publications and Information, Forest Products Laboratory, U.S. Department of Agriculture.* WOOD FIBER PRODUCTS.
- Coleman, Prof. Nathanie. Terry. *Soils Department, North Carolina State College.* SOILS (in part).
- Comings, Dean Edward Walter. *School of Engineering, University of Delaware* AUTOCLAVE; HIGH-PRESSURE PROCESSES.
- Comstock, John Paul. *Naval Architect (retired)* SHIPBUILDING.
- Condon, Prof. E. U. *Fellow, Joint Institute for Laboratory Astrophysics; Professor of Physics, University of Colorado.* ADIATION, MOLECULAR; ISOTOPES; SPIN.
- Conklin, Groff. *Associate Science Editor, American Heritage Dictionary, American Heritage Publishing Company.* Series of miscellaneous articles.
- Conner, Dr. Herbert W. (Formerly) *William Wrigley Jr. Company.* FOOD MANUFACTURING (in part).
- Cennors, James F. *Head, Section B, 10 x 10 Foot Supersonic Wind Tunnel Branch, Propulsion Aerodynamics Division, National Aeronautics and Space Administration.* DIFFUSER; SUPERSONIC DIFFUSER (both in part).
- Conquergood, Charles R. *Chairman of Board, Canada Printing Ink Company, Ltd., Toronto, Canada.* INK.
- Conrad, Prof. Albert Godfrey. *Dean of Engineering, University of California, Santa Barbara.* ELECTRICAL ENGINEERING; INDUCTION MOTOR; MECHANICAL RECTIFIER.
- Cook, Dr. Gerhard A. *Assistant Manager, Research Laboratory, Linde Division of Union Carbide Corporation.* HELIUM; HYDROGEN; OXYGEN; OZONE; articles on atmospheric gases.
- Cooley, Austin G. *Vice-President, Westrex Corporation.* FACSIMILE.

- Cooley, Prof. Hollis R. *New York University*. ALGEBRA; BINOMIAL THEOREM; ROOT-MEAN-SQUARE.
- Cooley, Dr. William E. *Research Chemist, Procter and Gamble Company*. GOLD; NICKEL; SILVER; ZINC.
- Coons, Dr. George Herbert. *Collaborator, Agriculture Research Service, U.S. Department of Agriculture*. SUGAR BEET (in part).
- Copeland, Prof. D. Eugene. *Biology Department, Tulane University*. SWIM BLADDER.
- Copenhaver, Prof. W. M. *Professor of Anatomy, College of Physicians and Surgeons, Columbia University*. CARDIOVASCULAR SYSTEM (in part).
- Corben, Dr. Herbert Charles. *Ramo-Wooldridge Corporation*. CENTRODE; DYNAMICS; KINEMATICS; MOTION.
- Core, Dr. Earl L. *Chairman, Department of Biology, West Virginia University*. HERBARIUM; PLANT KEYS; PLANT NAMES; other articles on botany.
- Corey, Horace Edmund, Jr. *Transmission Maintenance and Coordination Engineer, American Telephone and Telegraph Company*. TELEPHONE SERVICE (in part).
- Corliss, Dr. John O. *Professor and Head, Department of Biological Sciences, University of Illinois*. CILIOPHORA; articles on related taxonomic groups.
- Corliss, William. *Consultant*. NUCLEAR AIRCRAFT PROPULSION (in part); NUCLEAR ROCKET; SPACE BIOLOGY (in part).
- Cornish, Dr. Joseph Jenkins, III. *Associate Director of Research, Aerospace Sciences, Lockheed-Georgia Company*. BOUNDARY-LAYER FLOW.
- Corson, Almon J. *Consulting Engineer (retired), Instrument Department, General Electric*. POTENTIOMETER (VOLTAGE MEASUREMENT); VOLTAGE MEASUREMENT (in part); VOLTMETER.
- Cotton, Irwin W. *Retired*. THERMOSTAT.
- Couch, Prof. John N. *Kenan Professor of Botany, University of North Carolina*. ACTINOPTERIDACEAE.
- Coulombre, Dr. Alfred J. *Chief, Laboratory of Neuroanatomical Sciences, National Institute of Neurological Diseases and Blindness, National Institutes of Health*. EYE (in part).
- Court, Dr. Arnold. *Forest Service, U.S. Department of Agriculture*. AIR TEMPERATURE; FROST; TEMPERATURE INVERSION; other articles on meteorology.
- Cowart, Vice-Adm. Kenneth Keith. *Engineer-in-Chief (retired), U.S. Coast Guard*. MARINE ENGINEERING; MARINE MACHINERY (in part); SHIP PROPULSION.
- Cowles, Prof. Philip B. *Professor of Microbiology, Yale University School of Medicine*. BACTERIA, LYSOGENIC; BACTERIOPHAGE; COLIPHAGE; other articles on medical microbiology.
- Cox, Dr. Charles S. *Scripps Institution of Oceanography*. WAVE (CAPILLARY); WAVE (INTERNAL).
- Cox, Dr. Everett Franklin. *Research Scientist, Whirlpool Corporation*. ATMOSPHERIC ACOUSTICS.
- Cox, Dr. Gertrude M. *Head, Statistics Research Division, The Research Triangle Institute*. EXPERIMENT.
- Coxeter, Prof. H. S. M. *Professor of Mathematics, University of Toronto, Canada*. POLYTOPES, REGULAR.
- Crabill, Dr. Ralph Edwin. *Curator, Division of Myriapoda and Arachnida, Department of Entomology, United States National Museum*. CHILOPODA; MYRIAPODA; PAUROPODA; SYMPHYLA.
- Crafts, Prof. Alden S. *Professor emeritus, Department of Botany, University of California, Davis*. DEFOLIANT; HERBICIDE; SOIL STERILIZATION.
- Craig, Prof. Homer Vincent. *Professor of Mathematics, University of Texas*. GEOMETRY, RIEMANNIAN; GRADIENT OF A SCALAR; GREEN'S THEOREM; other articles on mathematics.
- Craine, Prof. Lyle E. *Department of Conservation, School of Natural Resources, University of Michigan*. LAND USE PLANNING.

- Cramer, Prof. Dr. Friedrich D. *Professor of Chemistry, Department Head, Max-Planck-Institut für Experimentelle Medizin, Göttingen, Germany.* CLATHRATE COMPOUNDS; SYNTHESIS OF NUCLEIC ACIDS.
- Crampton, Dr. Donald Kelsey. *Chase Brass and Copper Company, Inc. (retired).* COPPER ALLOYS.
- Crary, Dr. Albert Paddock. *National Science Foundation.* ICE ISLAND.
- Craven, Dr. John Pinna. *Chief Scientist, Special Projects Office, U.S. Bureau of Weapons.* HYDROFOIL CRAFT.
- Crentz, William L. *Assistant Director, Coal Research, U.S. Bureau of Mines.* MINING OPERATING FACILITIES (in part).
- Creson, William K. *Consulting Engineer, Ross Gear and Tool Company, Inc.* ACKERMAN STEERING; AUTOMOTIVE STEERING; STEERING, POWER.
- Crittenden, Dr. Charles V. *Consultant in Geography.* AIR, CYCLONE; ISOSTASY; NORTH AMERICA (in part).
- Crockford, Prof. H. D. *Department of Chemistry, University of North Carolina.* HYDROGEN ION (in part).
- Croneis, Dr. Carey. *Chancellor and Harry Carothers Wiess Professor of Geology, Rice University.* ANNELIDA FOSSILS.
- Crouse, William H. *Editor-in-Chief, McGraw-Hill Encyclopedia of Science and Technology.* AUTOMOTIVE SUSPENSION, JOINT (MECHANICAL); SOLAR HEATING; VOLTAGE REGULATOR, AUTOMOTIVE.
- Crow, Prof. James F. *Professor of Medical Genetics, University of Wisconsin.* EUGENICS; HARDY-WEINBERG FORMULA; HETEROZIS; HUMAN GENETICS (in part).
- Crowell, Dr. Sears. *Professor of Zoology, Indiana University.* HYDROIDA; HYDROZOA, articles on related taxonomic groups.
- Cubberley, Adrian H. *Product Development Coordinator, Plastics and Coal Chemicals Division, Allied Chemical Corporation.* NIACIN (in part).
- Cubieciotti, Dr. Daniel. *Research Chemist, Stanford Research Institute.* HAFNIUM; ZIRCONIUM.
- Cuckler, Lee E. *Robertshaw-Fulton Controls Company, Aeronautical and Instrument Division.* MOISTURE-CONTENT MEASUREMENT.
- Culbertson, Dr. Joseph O. *Assistant Chief, Oilseed and Industrial Crops Research Branch, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture.* FLAX (in part).
- Cumberland, Dr. Kenneth B. *Professor of Geography, University of Auckland, New Zealand.* AUSTRALIA AND NEW ZEALAND.
- Cumming, Donald C. *Headquarters of Manufacturing Laboratory, Westinghouse Electric Corporation.* ASSEMBLY METHODS.
- Cummins, Prof. Harold. *Professor emeritus of Anatomy, School of Medicine, Tulane University.* EPIDERMAL RIDGES; INTEGUMENTARY PATTERNS.
- Cunningham, Prof. Burris B. *Department of Chemistry and Radiation Laboratory, University of California.* CURIUM; METALLO-ACID ELEMENTS; PERIODIC TABLE; TRANSITION ELEMENTS.
- Curdts, E. B. *Director of Engineering, James G. Biddle Company.* FREQUENCY MEASUREMENT (in part).
- Currie, Ronald I. *Head of Biological Department, National Institute of Oceanography, England.* SEA WATER FERTILITY (in part).
- Curtin, Dr. Charles B. *Associate Professor of Biology, Creighton University.* DENTITION; MYIASIS; SENSE ORGAN; series of articles on animal taxonomy.
- Curtis, Prof. John T. (Formerly) *University of Wisconsin.* CLIMAX COMMUNITY.
- Curtiss, Prof. C. F. *Professor of Chemistry, University of Wisconsin.* GAS (in part).
- Curtiss, Dr. Leon F. *National Bureau of Standards.* CURIE; RAD; RADIOACTIVITY STANDARDS; ROENTGEN UNIT.

## D

Czarnecki, Edwin Gregory. *Program Manager, Voyager Spacecraft Systems, Aerospace Group, Space Division, The Boeing Company.* SPACECRAFT STRUCTURES.

Dachille, Dr. Frank. *Associate Professor of Geochemistry, Pennsylvania State University.* HIGH-PRESSURE PHENOMENA (in part).

Dahl, Dr. Lawrence F. *Professor of Chemistry, University of Wisconsin.* X-RAY DIFFRACTION (in part).

Dale, Prof. Dr. Walter Max. *Former Head, Department of Biochemistry, Christie Hospital, Manchester, England.* RADIATION BIOCHEMISTRY.

Dalitz, Prof. Richard H. *Physics Department and Enrico Fermi Institute for Nuclear Studies, University of Chicago.* HYPERON; MESON; STRANGE PARTICLE; other articles on elementary particles.

Dalton, Dr. Albert J. *National Cancer Institute* GOLGI COMPONENT.

Damon, Dr. Paul Edward. *Geology Department, University of Arizona.* ATMOSPHERE, GEOCHEMISTRY OF; TERRESTRIAL NUCLEAR REACTIONS.

Dan, Dr. Jean C. *Lecturer in Embryology, Ochanomizu University, Tokyo, Japan.* INVERTEBRATE EMBRYOLOGY.

Dana, Alan Standish. *Consulting Engineer for The Kerite Company.* INSULATION, ELECTRIC (in part).

Dana, Dr. Samuel Trask. *Dean emeritus, School of Natural Resources, The University of Michigan.* FOREST AND FORESTRY

Daniels, Prof. Farrington. *Professor emeritus of Chemistry, University of Wisconsin.* CHAIN REACTION, CHEMICAL; HALF-LIFE (in part); KINETICS (CHEMICAL); PHYSICAL CHEMISTRY.

Dapples, Prof. Edward C. *Department of Geology, Northwestern University.* AUTHIGENIC MINERALS; DIAGENESIS.

Daugherty, Prof. Robert Long. *Professor emeritus of Mechanical and Hydraulic Engineering, California Institute of Technology.* FLOW OF FLUIDS.

Davis, Dr. Charles C. *Professor, Department of Biology, Western Reserve University.* MONSTROUS LIDA

Davis, Dr. Charles Moler. *Professor of Geography and Chairman of Department of Geography, University of Michigan.* FOREST VEGETATION; VEGETATION ZONES (WORLD); other articles on physical geography.

Davis, D. Dwight. *Former Curator of Vertebrate Anatomy, Chicago Natural History Museum.* MAMMALIA; articles on related taxonomic groups.

Davis, Dr. David E. *Department of Zoology, Pennsylvania State University.* ECOLOGIC INTERACTIONS.

Davis, Dr. H. Chandler. *Professor of Mathematics, University of Toronto, Canada.* MATHEMATICAL NOTATION, CONTEMPORARY (in part)

Davis, Dr. Hallowell. *Director emeritus, Research, Central Institute for the Deaf.* HEARING AID.

Davis, Dr. John H. *Professor of Botany, University of Florida.* DUNE VEGETATION; MANGROVE SWAMP.

Davis, Lieut. Gen. Leighton I. *Commander, National Range Division, Andrews Air Force Base, Washington, D.C.* ARMAMENT, AIR.

Davis, Rowland F. *Products Planning Engineer, American Telephone and Telegraph Company.* INTERCOMMUNICATING SYSTEM; TELEPHONE; other articles on telephones.

Deacon, Dr. George E. R. *Director, National Institute of Oceanography, Surrey, England.* ANTARCTIC OCEAN.

De Cicco, Dr. John. *Department of Mathematics, Illinois Institute of Technology, Chicago.* GEOMETRY. NONEUCLIDEAN.

de Florez, Admiral Luis. *Former Consulting Engineer.* HUMAN ENGINEERING.

DeGarmo, Dr. Oliver. *Monsanto Chemical Company.* PESTICIDES (in part).

- Dekeyser, Prof. Dr. Willy Clement. *University of Ghent, Belgium.* COORDINATION NUMBER; CRYSTAL STRUCTURE; CRYSTALLOGRAPHY; other articles on crystallography.
- Dekker, Dr. A. J. *Professor of Solid State Physics, University of Groningen, Holland.* FIELD EMISSION; SECONDARY EMISSION; THERMIONIC EMISSION; other articles on electronic properties of solids.
- Delahay, Prof. Paul. *Professor of Chemistry, New York University.* COULOMETER; ELECTROLYSIS; OVERVOLTAGE; other articles on physical chemistry.
- de Launay, Dr. Jules. *Superintendent of Solid State Division, Naval Research Laboratory.* HYSTERESIS, THERMAL; LATTICE VIBRATIONS; PHONON; SPECIFIC HEAT OF SOLIDS.
- Drelevozas, Prof. Theodore. *Associate Professor, Department of Biology, and Curator of Paleobotany, Peabody Museum of Natural History, Yale University.* CYCADEOIDALES.
- de Montmollin, Dr. Fernand. *Hoffmann-LaRoche Inc. (retired).* THIAMINE (in part).
- Den Hartog, Prof. Jacob P. *Department of Mechanical Engineering, Massachusetts Institute of Technology.* BRIDGE VIBRATION; MECHANICAL VIBRATION; SHAFT BALANCING.
- Denison, Dr. Robert H. *Curator of Fossil Fishes, Chicago Natural History Museum.* OSTIOSTRACI, articles on related fossil groups.
- Denny-Brown, Dr. Derek E. *Professor of Neurology, Harvard University Medical School.* ELECTROMYOGRAM.
- Deno, Dr. Richard A. *Professor of Pharmacognosy, University of Michigan.* PHARMACOGNOSY; PHARMACY.
- Derge, Prof. Gerhard. *Carnegie Institute of Technology.* FERRO-ALLOY; STEEL MANUFACTURE.
- Desossier, Dr. Norman. *Department of Horticulture, Purdue University.* FOOD MANUFACTURING (in part).
- DeTar, Prof. DeLos F. *Department of Chemistry, Florida State University.* RESONANCE (MOLECULAR STRUCTURE).
- DeVaney, Fred D. *Director of Metallurgy and Research, Pickands, Mather, and Company.* MAGNETIC SEPARATION METHODS.
- De Vaucouleurs, Prof. Gerard H. *Professor of Astronomy, University of Texas.* ASTRONOMICAL UNIT; JUPITER; MARS; PLANET, other articles on astronomy.
- DeVore, Dr. George W. *Department of Geology, Florida State University.* AMPHIBOLE; PYROXENE, articles on related minerals.
- Dexter, Dr. Theodore Henry. *Research Supervisor, Inorganic Chemistry, Hooker Chemical Corporation Research Center.* HYDRAZINE.
- D'Ianni, Dr. J. D. *Assistant to Vice-President, Research and Development, Goodyear Tire and Rubber Company.* RUBBER.
- Diaz, Prof. Joaquin B. *Research Professor, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.* DIFFERENTIAL EQUATION.
- Dice, Dr. Lee R. *Professor emeritus of Zoology, University of Michigan.* ECOLOGY, HUMAN.
- Dick, Prof. B. G. *Professor of Physics, University of Utah.* INSULATOR, ELECTRIC; IONIC CRYSTALS; MADELUNG CONSTANT.
- Dieke, Prof. G. H. *Chairman, Department of Physics, Johns Hopkins University.* ELECTROOPTICS; FARADAY EFFECT; KERR EFFECT; MAGNETOOPTICS; ZEEMAN EFFECT (in part).
- Dienes, Dr. Louis L. *Massachusetts General Hospital, Boston.* PLEURO-PNEUMONIAL-LIKE ORGANISM.
- Dienst, Prof. Robert Barton. *Chairman, Department of Medical Microbiology and Public Health, Medical College of Georgia.* GRANULOMA INGUINALE (in part).
- Dietrich, Prof. Dr. Gunter Otto. *Director, Institute of Oceanography, University of Kiel, Germany.* ATLANTIC OCEAN; OCEAN CURRENTS (in part.)

- Dietz, Dr. Robert Sinclair. *U.S. Navy Electronics Laboratory, San Diego*. BATHYSCAPH; CONTINENTAL SHELF AND SLOPE.
- Dill, Robert Floyd. *Marine Geologist, Sea Floor Studies Section, U.S. Navy Electronics Laboratory, San Diego*. SCUBA; SKIN DIVING; UNDERWATER PHOTOGRAPHY (in part).
- Diller, Dr. Oliver Daniel. *Chairman, Department of Forestry, Ohio Agricultural Research and Development Center*. FOREST CONSERVATION.
- Dinsmore, Ray Putnam. *Vice-President (retired), Research and Development, Goodyear Tire and Rubber Company*. RUBBER.
- Dinsmore, Comdr. Robertson Pickett. *International Ice Patrol, U.S. Coast Guard*. ICEBERG.
- Dodds, Robert Hungerford. *Personnel Manager, Gibbs and Hill, Inc.* PHOTOGRAMMETRY; SURVEYING; TOPOGRAPHIC SURVEYING AND MAPPING; other articles on civil engineering.
- Dodson, Dr. Edward O. *Department of Biology, University of Ottawa, Canada*. PROTECTIVE COLORATION; SEXUAL DIMORPHISM.
- Dollear, Frank Gilbert. *Head, Peanut Products Investigations, Southern Utilization Research and Development Division, U.S. Department of Agriculture*. BUTTER; FAT AND OIL, FIDBLE (both in part); MARGARINE.
- Dominasch, Daniel Otto. *President, Dudco, Inc.* AIRCRAFT INSTRUMENT PANEL (in part); FLIGHT CHARACTERISTICS.
- Donn, Prof. William L. *Department of Geology, The City College of New York*. SEICHE.
- Doob, Prof. Joseph Leo. *Professor of Mathematics, University of Illinois*. STOCHASTIC PROCESS.
- Dorcus, Prof. Roy Melvin. *University of California at Los Angeles*. HYPNOSIS.
- Dorf, Prof. Erling. *Professor of Geology, Princeton University*. PALEOBOTANY (in part); PETRIFIED FORESTS.
- Dorfman, Dr. Ralph I. *Senior Vice-President and Director, Syntex Institute for Hormone Biology, Palo Alto, California*. BILE ACID; DIGITOXIGENIN; PROGESTERONE; other articles on adrenal cortex steroids.
- Dornfeld, Dr. Ernst John. *Chairman, Department of Zoology, Oregon State University*. CELL (BIOLOGICAL) -in part.
- Dossel, Dr. William Edward. *Assistant Professor of Anatomy, University of North Carolina School of Medicine*. PARATHYROID GLAND (in part).
- Doudoroff, Prof. Michael. *Professor of Bacteriology and Immunology; Professor of Molecular Biology, University of California*. CARBOHYDRATE METABOLISM; KREBS CYCLE; other articles on phosphate compounds in metabolism.
- Dougherty, Dr. Ellsworth C. *Department of Nutritional Sciences, College of Agriculture, University of California*. CAPREILIDEA.
- Dougherty, Richard Erwin. *Consulting Engineer*. RAILROAD ENGINEERING.
- Douglas, Donald W., Jr. *President, Douglas Aircraft Company, Inc.* AIRCRAFT TESTING.
- Douglas, Prof. Howard C. *Department of Microbiology, University of Washington*. HYPHOMICROBIALES; MICROCOCCACEAE; NEISSERIAEAE.
- Douglass, Prof. Raymond Donald. *Professor of Mathematics, Massachusetts Institute of Technology*. NOMOGRAPH.
- Dowd, James J. *Chief, Mining and Preparation Section, U.S. Bureau of Mines*. MINING, STRIP.
- Doyle, Edwin S. *National Canners Association Research Laboratory*. FOOD ENGINEERING (in part).
- Drake, Dr. Charles H. *Department of Bacteriology and Public Health, Washington State University*. ZOONOSES.
- Draper, Dr. Arthur L. *Associate Professor of Chemistry, Texas Technological College*. ADSORPTION; ELECTROSTATIC PRECIPITATOR; SURFACE PHENOMENON (all in part).



- Dresden, Prof. Max. *Department of Physics, Northwestern University*. **BOLTZMANN STATISTICS**; **KINETIC THEORY OF MATTER**; **STATISTICAL MECHANICS**; other articles on statistical physics.
- Droessler, Dr. Earl G. *Program Director for Atmospheric Sciences, National Science Foundation*. **NAVAL METEOROLOGY**.
- Duckworth, Prof. Henry Edmison. *Department of Physics, McMaster University, Canada*. **BINDING ENERGY**, **NUCLEAR** (in part); **ISOTOPE**; other articles on atomic and nuclear physics.
- Duke, Dr. Kenneth L. *Associate Professor of Anatomy, Duke University Medical Center*. **OVARY** (in part).
- Duley, Dr. Frank L. *Colorado State University, Fort Collins; Advisor in Soils, University of Peshawar, West Pakistan*. **SOIL** (in part).
- DuMond, Prof. Jesse William Monroe. *California Institute of Technology*. **COMPTON EFFECT**.
- Dunbar, Dr. Carl O. *Professor emeritus of Paleontology and Stratigraphy, Yale University*. **FOSSIL**, **PALEONTOLOGY**; **PERMIAN**; other articles on fossils.
- Duncan, Charles Clifford. *Assistant Vice-President, American Telephone and Telegraph Company*. **PRIVACY SYSTEMS (SCRAMBLING)**; **TELEPHONE SERVICE** (in part); **TELEPHOTOGRAPHY**.
- Duncan, Dr. Helen. *U.S. Geological Survey, National Museum*. **BRYOZOA FOSSILS**.
- Duncombe, Dr. Raynor Lockwood. *U.S. Naval Observatory*. **CELESTIAL MECHANICS**; **ORBITAL MOTION: PERTURBATION (ASTRONOMY)**, other articles on celestial mechanics.
- Dunegan, John Clymer. *Agricultural Consultant*. **CHERRY**; **PEACH**; **PLUM** (all in part).
- Dunkle, Dr. David H. *U.S. National Museum, Smithsonian Institution*. **PLACODERMI**; articles on related fossil groups.
- Dunlop, Charles A. *Consultant; Professional Engineer*. **OIL AND GAS WELLS** (in part).
- Dunn, Dr. Hugh K. *Senior Research Physicist, Communication Sciences Laboratory, University of Michigan*. **MASKING (SOUND)**; **PHONETICS**; **PSYCHOACOUSTICS**; **VOCODER**.
- Dunn, Dr. J. Avery. *Sales Manager, Atlantic Gelatin, Division of General Foods Corporation*. **GELATIN**.
- Duntley, Dr. Seibert Quimby. *Visibility Laboratory, Scripps Institution of Oceanography, University of California*. **SEA WATER** (in part).
- Durand, Prof. L., III. *Physics Department, University of Wisconsin*. **SCATTERING MATRIX**.
- E** Eardley, Dean Armand John. *College of Mines and Mineral Industries, University of Utah*. **CORDILLERAN BELT**; **MOUNTAIN SYSTEMS**; **TECTONIC PATTERNS**.
- Eaton, Capt. Eldridge, Jr. *U.S. Air Force*. **AUTOMATIC ASTRO-NAVIGATION**.
- Ebert, Prof. James David. *Director, Department of Embryology, Carnegie Institution of Washington*. **HEMATOPOIESIS** (in part).
- Eckart, Prof. Carl. *University of California at San Diego*. **SEA WATER** (in part).
- Eckels, Prof. Arthur R. *Department of Electrical Engineering, University of Vermont*. **COMMUTATION**; **SLIP RINGS** (in part); **WINDINGS (ELECTRIC MACHINERY)**; other articles on electrical engineering.
- Eckhardt, Dr. E. A. *Vice-President (retired), Gulf Research and Development Company*. **GEOPHYSICAL EXPLORATION**; **PROSPECTING, PETROLEUM** (in part).
- Economou, George A. *Staff Engineer, Perkin-Elmer Corporation*. **OPTICAL TRACKING INSTRUMENTS**.
- Eddy, Dr. Samuel. *Department of Zoology, University of Minnesota*. **LIMNOLOGY**.
- Edgerton, Prof. Harold E. *Massachusetts Institute of Technology*. **STROBOSCOPIC PHOTOGRAPHY**; **UNDERWATER PHOTOGRAPHY** (in part).

- Edwards, Prof. John O. *Professor of Chemistry, Brown University*. IRON.
- Edwards, Dr. Russell K. *Chemical Engineering Division, Argonne National Laboratory*. CARBIDE; NITRIDE; OXIDE.
- Egan, John Joseph. *Marketing Research Division, Union Carbide Metals Company*. IRON ALLOYS (in part).
- Eggers, Dr. Alfred J., Jr. *Deputy Associate Administrator for Advanced Research and Technology, National Aeronautics and Space Administration*. NOSE CONE; REENTRY.
- Eggertsen, Dr. Frank Thomas. *Research Chemist, Shell Development Company*. GAS ANALYSIS; GAS CHROMATOGRAPHY.
- Egler, Dr. Frank E. *Director, Aton Forest*. PLANT GEOGRAPHY; VEGETATION MANAGEMENT (RIGHTS OF WAY).
- Ehricke, Kraft A. *Director, Centaur-Spacecraft Program, Convair-Astronautics*. ELECTROMAGNETIC PROPULSION; ION PROPULSION; MAGNETOGAS DYNAMICS; SOLAR ENGINE.
- Ehrlich, Dr. John. *Laboratory Director in Antibiotic Research, Parke, Davis and Company*. CHLORAMPHENICOL.
- Ehrlich, Dr. Paul R. *Associate Professor of Biological Sciences and Curator of the Entomological Collections, Stanford University*. LEPIDOPTERA.
- Ehrlich, R. W. *Assistant Chief Engineer, American Telephone and Telegraph Company*. TELEPHONE SERVICE (in part).
- Eide, Prof. Carl J. *Professor of Plant Pathology, University of Minnesota*. PLANT DISEASE (in part); TURNIP.
- Eidensohn, Samuel. *Former Chief Project Engineer, Industrial Division, Electric Storage Battery Company*. DRY CELL; NUCLEAR BATTERY; WET CELL; other articles on batteries.
- Einset, Dr. John. *Professor of Pomology, Cornell University*. GRAPE CULTURE (in part).
- Elderfield, Prof. Robert Cooley. *Department of Chemistry, University of Michigan*. CARBANION; CARBONIUM ION; ORGANIC CHEMISTRY.
- Elias, Dr. M. Hans. *Department of Anatomy, Chicago Medical School*. LIVER (in part).
- Eliassen, Prof. Arnt. *University of Oslo, Norway*. METEOROLOGY (in part).
- Ellis, Dr. Nathan Kent. *Assistant Director, Purdue University Experiment Station*. TOMATO.
- Ellison, Prof. Samuel P., Jr. *Professor of Geology, Chairman of Department of Geology, University of Texas*. CONODONT.
- Eltgroth, George V. *Patent Counsel, Industrial Electronics Division, General Electric Company*. PATENT.
- Ely, F. G. *Research and Development Division, Babcock and Wilcox Company (retired)*. BOILER WATER; STEAM BOILER, WATER-TUBE BOILER; other articles on steam power.
- Emerson, Lewis P. *Engineer in Charge of Flow Measurement, Foxboro Company*. FLOW MEASUREMENT (in part).
- Emerson, Prof. Ralph. *Department of Botany, University of California*. PHYCOMYCETES.
- Emerson, Dr. William Keith. *American Museum of Natural History, New York*. SCAPHOPODA.
- Emmel, Dr. Victor M. *Professor of Anatomy, University of Rochester School of Medicine and Dentistry*. DIGESTIVE SYSTEM (in part).
- Engelhart, R. W. (Formerly) *Parker Rust Proof Company, Detroit*. METAL COATINGS (in part).
- English, Prof. Van H. *Professor of Geography, Dartmouth College*. EQUINOX; GEOGRAPHY, MATHEMATICAL; INTERNATIONAL DATE LINE; other articles on physical geography.
- Engström, Prof. Arne. *Head, Department of Medical Physics, Karolinska Institute, Stockholm, Sweden*. MICROSCOPE, X-RAY.
- Epstein, Prof. Samuel. *California Institute of Technology*. GEOLOGICAL THERMOMETRY (in part).
- Epstein, Samuel. *Technical Adviser (retired), Bethlehem Steel Company*. STEEL.

- Epstein, Dr. Samuel S. *Chief Chemist and Vice-President, Kirsch Beverages, Inc., and No-Cal Corporation.* FOOD MANUFACTURING (in part).
- Erdélyi, Prof. A. *Professor of Mathematics, University of Edinburgh, Scotland.* ELLIPTIC FUNCTION AND INTEGRAL; SPHERICAL HARMONICS.
- Ericson, David Barnard. *Lamont Geological Observatory.* MARINE SEDIMENTS (in part).
- Eriksson, Dr. Erik. *International Meteorological Institute, Stockholm, Sweden.* ATMOSPHERIC CHEMISTRY.
- Esau, Prof. Katherine. *Professor of Botany, University of California.* PLANT ORGANS; SECRETORY STRUCTURES, PLANT; VASCULAR BUNDLES; other articles on plant anatomy.
- Esig, Prof. E. O. (Formerly) *Department of Entomology, University of California.* THYSANOPTERA; articles on related taxonomic groups.
- Etherington, Harold. *Atomic Energy Consultant.* NUCLEAR ENGINEERING.
- Ettenberg, Eugene M. *Lecturer, Graphic Arts, Columbia University.* TYPE (PRINTING).
- Evans, Prof. F. Gaynor. *Department of Anatomy, University of Michigan School of Medicine.* SKELETAL SYSTEM (in part).
- Evans, Prof. Francis C. *Professor of Zoology, University of Michigan.* POPULATION DISPERSION.
- Evans, Dr. John W. *Director, Sacramento Peak Observatory, U.S. Air Force.* SUN; series of related articles.
- Evans, Prof. Robley D. *Department of Physics, Massachusetts Institute of Technology.* ALPHA RAYS; HALF-LIFE (in part); RADIOACTIVITY.
- Evans, Dr. Theodore W. *Shell Development Company.* PETROCHEMICAL (in part).
- Everetts, John, Jr. *Consulting Engineer, Charles S. Leopold, Inc., Engineers.* DEHUMIDIFIER; PSYCHROMETRICS.
- Everitt, Dean William Littell. *Dean of Engineering, University of Illinois.* COMMUNICATIONS, ELECTRICAL.
- Ewing, Dr. Gifford C. *Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.* SEA WATER (in part).
- Ewing, Dr. John I. *Senior Research Associate, Lamont Geological Observatory.* SUBMARINE TOPOGRAPHY (in part).
- Ewing, Dr. Maurice. *Higgins Professor of Geology, Columbia University; Director, Lamont Geological Observatory.* SUBMARINE TOPOGRAPHY (in part).
- Eyring, Prof. Henry. *University of Utah.* RHEOLOGY.
- F** Failla, Dr. Gioacchino. *Former Director, Radiological Research Laboratory, Columbia University.* NUCLEAR RADIATION (BIOLOGY)-in part; RADIOLOGY.
- Fairbank, Prof. William A. *Professor of Physics, Stanford University.* SUPERFLUIDITY.
- Fan, Prof. H. Y. *Physics Department, Purdue University.* CYCLOTRON RESONANCE EXPERIMENTS; SEMICONDUCTOR; articles on solid-state physics.
- Fankhauser, Prof. Gerhard. *Department of Biology, Princeton University.* ANDROGENESIS; EMBRYOGENESIS; GYNOGENESIS; MEROGONY.
- Fankuchen, Prof. I. *Polytechnic Institute of Brooklyn.* X-RAY CRYSTALLOGRAPHY.
- Fawcett, Prof. Don Wayne. *Hersey Professor of Anatomy, Harvard Medical School.* CELL-SURFACE DIFFERENTIATION; MITOCHONDRIA.
- Feldman, Cyrus. *Supervisor, Spectrochemical and X-ray Analysis, Oak Ridge National Laboratory.* FLAME PHOTOMETRY; SPECTROCHEMICAL ANALYSIS.
- Fell, Dr. Howard Barraclough. *Curator of Invertebrate Zoology, Museum of Comparative Zoology, Harvard University.* ECHINODERMATA; articles on related taxonomic groups.

- Feller, Prof. William. *Princeton University*. COMBINATION AND PERMUTATION; DISTRIBUTION (PROBABILITY); PROBABILITY.
- Fellers, Dr. Carl R. *Former Food Consultant*. FOOD ENGINEERING (in part).
- Fellinger, Robert Cecil. *Professor of Mechanical Engineering, Iowa State University of Science and Technology*. BELT DRIVE; GEAR; PULLEY; other articles on machine design.
- Felver, Prof. Richard Irving. *Designer, Carnegie Institute of Technology*. PRODUCT DESIGN; PRODUCTION ENGINEERING.
- Ferguson, Dr. Edward, Jr. *Head, Department of Biology, Lincoln University*. PLATYCOPA; articles on related taxonomic groups.
- Ferguson, Eugene S. *Curator, Division of Mechanical and Civil Engineering, U.S. National Museum, Smithsonian Institution*. CAM MECHANISM; FOUR-BAR LINKAGE; VELOCITY ANALYSIS; other articles on machine design.
- Ferguson Wood, Edward James. *Division of Fisheries and Oceanography, Commonwealth Scientific and Industrial Research Organization, Australia*. MARINE MICROBIOLOGY.
- Ferris, Gordon F. (*Formerly*) *Natural History Museum, Stanford University*. ANOPLURA; ENTOMOLOGY, ECONOMIC; INSECTA; MALLOPHAGA.
- Ferry, Dr. James F. *Professor of Biology, Madison College*. CLASSIFICATION, BIOLOGICAL; EGG (BOWL). PLANT RESPIRATION; WILLOW.
- Feshbach, Prof. Herman. *Department of Physics, Massachusetts Institute of Technology*. PERTURBATION (MATHEMATICS).
- Fields, Paul R. *Senior Chemist, Argonne National Laboratory, Illinois*. NOBELIUM.
- Filmer, Dr. Robert S. *New Jersey Agricultural Experiment Station, Rutgers University*. BEE AND BEEKEEPING (in part).
- Finberg, Alfred J. *Consultant in Food Technology*. FOOD MANUFACTURING (in part).
- Fink, Donald Glen. *General Manager, Institute of Electrical and Electronics Engineers*. TELEVISION STANDARDS.
- Finland, Dr. Maxwell. *George Richards Minot Professor of Medicine, Harvard University; Director, Thorndike Memorial Laboratory and Second and Fourth (Harvard) Medical Services, Boston City Hospital*. PNEUMOCOCCUS; PNEUMONIA.
- Fisher, Prof. Russell Arden. *Professor of Physics, Northwestern University*. DEGREE OF FREEDOM (MECHANICS); EULER'S EQUATIONS OF MOTION; KINETICS (CLASSICAL MECHANICS).
- Fisher, Dr. W. Allan. *Manager of Planning—Dyestuffs, National Aniline Division, Allied Chemical Corporation*. DIAZOTIZATION.
- Fisk, Prof. Nelson S. *Department of Civil Engineering, Columbia University*. CENTROIDS OF AREA AND LINES; EQUILIBRIUM OF FORCES; STATISTICS; other articles on civil engineering.
- Fiske, Dr. Milan D. *General Electric Research Laboratory*. MEISSNER EFFECT; SUPERCONDUCTIVITY.
- FitzPatrick, Dean James L. G. *Professor of Mechanical Technology, Staten Island Community College*. ORNITHOPTER.
- Fleminger, Dr. Abraham. *Research Biologist, Scripps Institution of Oceanography*. BRANCHIURA; LERNAEPOIDOIDA; NOTODELPHYODA.
- Fletcher, Prof. Harvey. *Physics Department, Brigham Young University*. ACOUSTICS; FLETCHER-MUNSON CONTOURS; PHYSIOLOGICAL ACOUSTICS.
- Flexser, Dr. Leo A. *Vice-President of Chemical Production, Hoffmann-LaRoche Inc.* RIBOFLAVIN (in part).
- Flint, Prof. Richard Foster. *Professor of Geology, Yale University*. GLACIAL EPOCH; PLEISTOCENE; QUATERNARY; REGENT.
- Flood, James E. *Solid-Liquid Separation Consultant, E. I. du Pont de Nemours and Company*. CENTRIFUGATION.
- Flynn, John P. *Associate Professor of Physiology (Psychiatry), Yale University School of Medicine*. ELECTROENCEPHALOGRAPHY; NEUROPHYSIOLOGY; PSYCHOGALVANIC RESPONSE.

- Foley, Francis B. *Consulting Metallurgist (retired), International Nickel Company.* STAINLESS STEEL.
- Fontana, Prof. Mars Guy. *Chairman, Department of Metallurgical Engineering, Ohio State University.* CORROSION (in part).
- Foote, Dr. Richard Herbert. *Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture.* DIPTERA.
- Ford, Dr. Richard. *Medical Examiner, County of Suffolk, Boston.* FORENSIC MEDICINE.
- Forster, Dr. Robert E. *Department of Physiology, Graduate School of Medicine, University of Pennsylvania.* RESPIRATION.
- Forsythe, Dr. Richard H. *Head, Department of Poultry Science, Iowa State University.* EGG PROCESSING; FOOD MANUFACTURING (in part).
- Fortune, Dr. W. B. *Executive Director of Control, Eli Lilly and Company.* PHARMACEUTICALS TESTING.
- Foster, Prof. Jackson W. *Professor of Microbiology, University of Texas.* BACTERIAL METABOLISM (in part); BACTERIAL PHYSIOLOGY; articles on microbiological methods and on fermentation of organic acids.
- Fox, Dr. Irving. *School of Tropical Medicine, University of Puerto Rico.* SIPHONAPTERA.
- Frame, Prof. J. Sutherland. *Professor of Mathematics, Michigan State University.* ANGLE; GEOMETRY, EUCLIDEAN; SURFACE AND SOLID OF REVOLUTION; other articles on mathematics.
- Frank, Prof. Bernard. *Former Professor of Watershed Management, Colorado State University.* WATER CONSERVATION.
- Frank, Dr. Peter W. *Professor of Biology, University of Oregon.* SPECIES POPULATION.
- Franklin, Dr. Edward C. *Associate Professor of Medicine, New York University School of Medicine.* GAMMA GLOBULIN.
- Franklin, Prof. Philip. *Former Professor of Mathematics, Massachusetts Institute of Technology.* SERIES.
- Franks, Russell Minor. *Marketing Research Division, Union Carbide Metals Company (retired).* IRON ALLOYS (in part).
- Frary, Dr. Francis Cowles. *Consulting Engineer, Alcoa Research Laboratories.* ALUMINUM.
- Frear, Dr. Donald E. H. *Director, Pesticide Research Laboratory, Pennsylvania State University.* FUMIGANT.
- Frehold, Dr. Prof. Hans. *Principal Research Scientist, Geological Survey of Canada.* JURASSIC.
- Freedman, Dr. Daniel X. *Department of Psychiatry, Director of Psychopharmacology Laboratory, Yale School of Medicine.* PSYCHIC ENERGIZER; PSYCHOPHARMACOLOGIC DRUGS; PSYCHOTOMIMETIC DRUG; TRANQUILIZER.
- Freedman, Steven Irwin. *Instructor, Mechanical Engineering Department, Massachusetts Institute of Technology.* ISENTROPIC FLOW (in part).
- Freeman, Prof. Ralph L. H. *Thomas Raymond Wolf Systems Group.* CASTING; ROLLING, METAL; SHEET METAL FORMING; other articles on metal working.
- Freeman, Dr. Reino S. *Senior Research Scientist, Ontario Research Foundation; Professor, University of Toronto, Canada.* CYCLOPHYLLIDEA; articles on related taxonomic groups.
- Freeman, Ronald A. *Partner, Staunton and Freeman, Consulting Engineers, New York.* AIRPORT ENGINEERING; RUNWAY, AIRPORT.
- Freiser, Dr. Henry. *Professor of Chemistry, University of Arizona.* EXTRACTION (in part).
- Friedel, Raymond F. *Associate Editor, 'Chemical Engineering.'* HEAT EXCHANGER.
- French, Dr. David W. *Professor, Department of Plant Pathology and Physiology, University of Minnesota.* TREE (in part); WOOD DECAY.
- Fretter, Prof. William B. *Department of Physics, University of California.* CLOUD CHAMBER; GEIGER-MÜLLER COUNTER; IONIZATION CHAMBER; articles on particle detectors.

- Freundt, Dr. E. A. *Statens Seruminstitut, Copenhagen, Denmark.* BACTEROIDACEAE; MYCOPLASMATALES.
- Frey, Prof. David G. *Department of Zoology, Indiana University.* FRESH-WATER ECOSYSTEM.
- Fried, Dr. Sherman. *Staff Member, Lawrence Radiation Laboratory, University of California.* AMERICIUM; NEPTUNIUM; RHENIUM; other articles on chemical elements.
- Friedman, Harold Leo. *Research Chemist, International Business Machines Research Center.* WATER.
- Fries, Dr. Erik F. B. *Associate Professor of Biology, City College of New York.* CHROMATOPHORE.
- Fritz, Dr. Sigmund. *U.S. Weather Bureau.* INSOLATION; METEOROLOGICAL SATELLITES.
- Frondel, Prof. Clifford. *Department of Mineralogy, Harvard University.* GARNET; RADIOACTIVE MINERALS; SILICATE MINERALS; articles on related minerals.
- Fry, Francis John. *Associate Professor of Electrical Engineering, University of Illinois.* BIOLOGICAL EFFECTS OF SOUND WAVES (in part).
- Fry, Prof. Frederick Ernest Joseph. *Department of Zoology, University of Toronto, Canada.* RESPIRATORY SYSTEM (in part).
- Fry, Prof. W. J. *Research Professor, Head, Biophysical Research Laboratory, University of Illinois.* BIOLOGICAL EFFECTS OF SOUND WAVES (in part).
- Fulks, Joe Robert. *U.S. Weather Bureau.* ATMOSPHERIC ADIABATIC CHANGE; FOG; PRECIPITATION (METEOROLOGY); other articles on meteorology.
- Fuller, Prof. Dudley D. *Department of Mechanical Engineering, Columbia University.* BEARINGS, ANTIFRICTIONAL.
- Fuller, Prof. Harry James. *Professor of Botany, University of Illinois.* CHLOROPHYTA; EUGLENOPHYTA.
- Fung, Dr. Yuan-cheng B. *Professor of Engineering, California Institute of Technology.* AEROELASTICITY; FLUTTER, AERONAUTICAL.
- Furnish, Prof. William M. *Professor, Department of Geology, State University of Iowa.* CEPHALOPODA FOSSILS (in part).
- Furnival, Dr. George M. *Biometrical Studies, Forest Service, U.S. Department of Agriculture.* FOREST MEASUREMENT.
- Fuson, Prof. R. C. *Department of Chemistry, University of Illinois.* VINYLLOGY.
- Galloway, Prof. Jesse J. *Professor emeritus of Geology and Paleontology, Indiana University.* STRONATOPOROIDEA.
- Galloway, Dr. William J. Bolt, *Beranek and Newman, Inc.* AIRCRAFT NOISE; MUFFLER; NOISE CONTROL (in part); other articles on acoustics.
- Gardiner, Dr. John L. (Formerly) *Animal Disease and Parasite Research Division, U.S. Department of Agriculture.* SPIRUIROIDEA.
- Gardiner, Dr. William Cecil. *Manager, Electrochemicals Section, Development Department, Chemicals Division, Olin Mathieson Chemical Corporation.* NITROGEN FIXATION.
- Gardner, Dr. Frank Easter. *Horticulturist, Agricultural Research Service, U.S. Department of Agriculture.* GRAPEFRUIT; LEMON; ORANGE; other articles on fruits.
- Gardner, Prof. Victor Ray. *Professor of Pomology (retired), Rutgers University.* AGRICULTURAL SCIENCE, PLANT.
- Garman, Dr. Philip. *Connecticut Agricultural Experiment Station.* ODONATA.
- Garrett, Prof. Alfred B. *Vice-President for Research, Ohio State University.* CHEMISTRY; ELEMENTS (CHEMICAL); SALT (CHEMICAL).
- Garrett, Dr. Frederic Daugherty. *Department of Anatomy, University of Miami School of Medicine.* THYMUS GLAND.
- Gauch, Dr. Hugh Gilbert. *Department of Botany, University of Maryland.* PLANT, MINERAL NUTRITION OF; PLANT, MINERALS ESSENTIAL TO.

- Gaudin, Prof. Antoine M. *Massachusetts Institute of Technology*. FLOTATION.
- Gaylord, Prof. Charles N. *Chairman, Department of Civil Engineering, University of Virginia*. ARCH; BRIDGE (in part); CIVIL ENGINEERING; other articles on civil engineering.
- Gaylord, W. M., Jr. *Carbon Products Division, Union Carbide Corporation*. GRAPHITE (in part).
- Geldard, Prof. Frank Arthur. *Stuart Professor of Psychology, Princeton University*. PAIN, GUTANEOUS; TEMPERATURE SENSES; TOUCH; other articles on somesthesia.
- Gemmill, Arthur Vernon. *Senior Associate Editor, 'Food Engineering,' McGraw-Hill Publishing Company*. FOOD ENGINEERING (in part).
- Gensmer, Prof. Maxwell *Howe Professor of Metallurgy, Columbia University*. METAL, MECHANICAL PROPERTIES OF.
- Gensler, Prof. Walter J. *Department of Chemistry, Boston University*. HETEROCYCLIC COMPOUNDS; INDOLE; QUINOLINE, related articles.
- Gergel, Max G. *Columbia Organic Chemicals Company*. FREON. HALOFORM REACTION (in part); HALOGENATED HYDROCARBON (in part).
- Gerjuoy, Dr. Edward. *John Jay Hopkins Laboratory for Pure and Applied Science, General Atomic Division of General Dynamics Corporation*. QUANTUM MECHANICS; QUANTUM THEORY, NON-RELATIVISTIC; QUANTUM THEORY, RELATIVISTIC; other articles on quantum physics.
- Gerlach, Dr. Arch C. *Chief, Map Division and Chair of Geography, Library of Congress*. GLOBE, TERRESTRIAL.
- Germer, Dr. Lester H. *Research Physicist, Bell Telephone Laboratories, Inc.* ELECTRON DIFFRACTION (in part).
- Gersh, Prof. Isidore. *Department of Animal Biology, School of Veterinary Medicine, University of Pennsylvania*. BLOOD (in part); CONNECTIVE TISSUE; EPITHELIUM; HISTOLOGY.
- Gershoff, Dr. Stanley Norton. *Department of Nutrition, Harvard School of Public Health*. VITAMIN series of articles on individual vitamins.
- Geitsch, Dr. Willis John. *Curator, Department of Entomology, American Museum of Natural History, New York*. AMBLEPYGID; PALPIGRADID; PEDIPALPI; UROPYGID.
- Grave, Dr. Elmer G. *Former Head, Biological Control Laboratories, F. F. Lilly and Company*. BIOASSAY (in part).
- Chiao, Albert. *Lawrence Radiation Laboratory, University of California*. LAWRENCIUM.
- Giannini, Prof. Nicholas J. *Professor of Pharmacology, Yale University School of Medicine*. CHEMOTHERAPY; series of articles on synthetic antibacterial agents.
- Gibbons-Fly, Walter. *Technical Advisor, Cinemascope, Inc.* CINEMATOGRAPHY.
- Gibson, Dr. James J. *Professor of Psychology, Cornell University*. PERCEPTION.
- Gibson, Dr. John Egan. *Dean of Engineering, Oakland University, Rochester, Michigan*. BRAKE (in part); CLUTCH (in part); ELECTROMAGNET; MAGNET WIRE; MAGNETIC CIRCUITS; SOLENOID (ELECTRICAL).
- Gibson, Dr. T. *Lecturer in Bacteriology, School of Agriculture, Edinburgh, Scotland*. BACILLACEA.
- Giedt, Prof. Warren H. *Department of Mechanical Engineering, University of California, Davis*. CONDUCTION (HEAT)—in part; CONVECTION (HEAT).
- Giese, Prof. Arthur Charles. *Department of Biological Sciences, Stanford University*. INFRARED RADIATION (BIOLOGY); ULTRAVIOLET RADIATION (BIOLOGY).
- Gigg, Dr. Roy. *Chemistry Division, National Institute for Medical Research, London, England*. LIPID; other articles on lipids.

- Gilbert, Dr. Edgar N. *Research Mathematician, Bell Telephone Laboratories, Inc.* INFORMATION THEORY.
- Giletti, Prof. Bruno John. *Department of Geology, Brown University.* OCEAN CURRENTS (in part).
- Gilliland, Prof. Edwin R. *Department of Chemical Engineering, Massachusetts Institute of Technology.* DISTILLATION.
- Gingrich, Prof. Newell S. *Professor of Physics, University of Missouri.* MECHANICS, CLASSICAL.
- Ginzton, Prof. Edward Leonard. *President and Chairman of the Board of Varian Associates.* AMPLITUDE-MODULATION DETECTOR; AMPLITUDE MODULATOR; other related articles.
- Gish, Oliver Holmes. *Assistant Director (retired), Department of Terrestrial Magnetism, Carnegie Institute of Washington.* ELECTROJET, UPPER AIR; TERRESTRIAL ELECTRICITY.
- Gittings, William Norton. *Standards Development and Training Course Specialist, General Electric Company.* FUSE, ELECTRIC; SWITCH, ELECTRIC; related articles on electrical components.
- Glasford, Prof. Glenn M. *Professor of Electrical Engineering, Syracuse University.* MULTIVIBRATOR; SAW-TOOTH WAVE; TIME-DELAY CIRCUITS; other articles on electronic circuits.
- Glass, Prof. Bentley. *Academic Vice-President and Professor of Biology, State University of New York at Stony Brook.* HUMAN GENETICS (in part).
- Glicksman, Dr. Richard. *Semiconductor and Materials Division, Radio Corporation of America.* ELECTRODE POTENTIAL.
- Glock, Dr. Waldo S. *Director and Professor, Tree-Ring Research Laboratory and Department of Geology, Macalester College.* DENDROCHRONOLOGY; TREE-RING HYDROLOGY.
- Gluckstein, Robert L. *Professor of Physics, University of Massachusetts.* RELATIVISTIC ELECTRODYNAMICS.
- Goddard, Prof. David R. *Department of Biology, University of Pennsylvania.* PLANT FERMENTATION.
- Goddu, Dr. Robert Fennio. *Research Supervisor, Hercules Powder Company.* FLUORIMETRIC ANALYSIS; POLARIMETRIC ANALYSIS. SPECTROPHOTOMETRIC ANALYSIS; other articles on chemical analysis.
- Godman, Robert R. *Chief, Office of Reliability and Quality Assurance, National Aeronautics and Space Administration, Lewis Research Center, Cleveland.* WIND TUNNEL INSTRUMENTATION.
- Goebel, Prof. Charles J. *Department of Physics, University of Wisconsin.* ELEMENTARY PARTICLE; PARITY (QUANTUM MECHANICS); SYMMETRY LAWS (PHYSICS); other articles on elementary particles.
- Goetzl, Dr. Claus G. *Materials Science Laboratory, Lockheed Missile and Space Company; Department of Materials Sciences, Stanford University.* POWDER METALLURGY.
- Goland, Leonard. *Vice-President, Research and Development, Kellett Aircraft Corporation.* AUTOGIRO.
- Goldberg, Prof. Edward David. *University of California at San Diego.* HYDROSPHERE; HYDROSPHERE, GEOCHEMISTRY OF; SEA WATER (in part).
- Goldblith, Prof. Samuel Abraham. *Executive Officer, Department of Nutrition and Food Science, and Professor of Food Science, Massachusetts Institute of Technology.* FOOD ENGINEERING (in part).
- Goldich, Dr. Samuel S. *State University of New York at Stony Brook.* BAUXITE; LATERITE.
- Gonser, Dr. Bruce W. *Battelle Memorial Institute, Columbus, Ohio.* METAL COATINGS (in part); TIN ALLOYS; TIN METALLURGY.
- Good, Dr. Irving John. *Joint Fellow of the Science Research Council and Trinity College, Oxford, England.* MONTE CARLO METHOD.
- Goodall, Prof. McChesney, Jr. *Director of Research, Burns Institute; Professor of Physiology, Professor of Surgical Research, University of Texas Medical Branch.* AVIATION MEDICINE; DECOMPRESSION ILLNESS; SPACE BIOLOGY (in part); WEIGHTLESSNESS.



- Goodchild, Dr. Chauncey G. *Candler Professor of Biology, Emory University.* PLATYHELMINTHES.
- Goodheart, Prof. Clarence Francis. *Chairman, Department of Electrical Engineering, Union College.* CIRCUIT, ELECTRIC; OPEN CIRCUIT; PARALLEL CIRCUIT; POTENTIOMETER (VARIABLE RESISTOR).
- Goodman, Bernard. *Professor of Physics, University of Missouri.* ACTION FIELD THEORY, CLASSICAL; FRAME OF REFERENCE; STATICS IN SPACE; other articles on classical mechanics.
- Goodnight, Dr. Clarence James. *Head, Department of Biology, Western Michigan University, Kalamazoo.* PHALANGIDA.
- Goody, Prof. Richard Mead. *Harvard University.* AIR GLOW; ATMOSPHERE; related articles on meteorology.
- Gordon, Dr. Isabella. *Crustacea Section, British Museum of Natural History, London, England.* MALACOSTRACA; articles on related taxonomic groups.
- Gordon, Dr. James P. *Bell Telephone Laboratories.* LASER (in part).
- Gordon, Prof. Louis. *Department of Chemistry and Chemical Engineering, Case Institute of Technology.* FLOCCULATION; PRECIPITATION (CHEMISTRY); SUPERSATURATION; VOLATILIZATION.
- Gordon, Dr. Saul. *Chairman, Chemistry Department, Flornham-Madison Campus, Fairleigh Dickinson University.* THERMOANALYSIS.
- Gordon, Dr. William Edwin. *Research Chemist, Arthur D. Little, Inc., Cambridge, Massachusetts.* EXPLOSION AND EXPLOSIVE; FIRE EXTINGUISHER; FLAME; series of related articles.
- Goss, Prof. Harold. *Professor emeritus of Animal Husbandry, University of California at Davis.* ANIMAL-FEED COMPOSITION.
- Gossner, Mrs. Simone Daro. *Astronomer, U.S. Naval Observatory, Washington, D.C.* ECLIPSE, ASTRONOMICAL; OCCULTATION; TRANSIT (ASTRONOMY).
- Gots, Dr. Joseph S. *Professor of Microbiology, School of Medicine, University of Pennsylvania.* BACTERIAL GENETICS.
- Govindjee. *Associate Professor of Botany and Biophysics, Department of Botany and Department of Physiology and Biophysics, University of Illinois.* PHOTOSYNTHESIS (in part).
- Gowen, Prof. John W. *Department of Radiology and Radiation Biology, Foothills Campus, Colorado State University.* SEX-INFLUENCED INHERITANCE.
- Graham, George K. *National Broadcasting Company, New York.* TELEVISION CAMERA; TELEVISION STUDIO.
- Grandelis, Doris Dida. *'Petroleum Week.'* PETROLEUM GEOLOGY.
- Granick, S. *Professor, The Rockefeller Institute.* CHLOROPHYLL.
- Grant, Professor David M. *Department of Chemistry, University of Utah.* NUCLEAR MAGNETIC RESONANCE, HIGH RESOLUTION.
- Grau, Dr. Frederick V. *Consulting Agronomist.* VETCH.
- Graumann, Dr. Hugo O. *Associate Director, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture.* ALFALFA.
- Graves, Dr. Arthur Harmount. *Consultant in Genetics, Connecticut Agricultural Experiment Station; Curator emeritus, Brooklyn Botanic Gardens.* TREE (in part); series of articles on various trees.
- Graves, Prof. Lawrence Murray. *Professor of Mathematics, University of Chicago.* INFINITY; INTEGRATION; REAL VARIABLE.
- Gray, Dr. Peter. *Andrey Avinoff Professor of Biology, University of Pittsburgh.* MICROTECHNIQUE.
- Gray, Dr. Reed A. *Research Plant Physiologist, Stauffer Chemical Company.* GIBBERELLIN.
- Greenberg, Prof. David M. *Department of Biochemistry, University of California School of Medicine.* PROTEIN METABOLISM.
- Greenblatt, Dr. Robert Benjamin. *Medical College of Georgia.* GRANULOMA INGUINALE (in part).
- Greenfield, Robert Edman. *Vice-President (retired), Manufacturing, A. E. Staley Manufacturing Company.* Soybean (in part).

- Greensfelder, Dr. Bernard S. *Consultant; Senior Scientist, Stanford Research Institute.* AROMATIZATION; CRACKING; DEPOLYMERIZATION.
- Greenspan, Martin. *National Bureau of Standards.* DAMPING; FORCED OSCILLATION; IMPEDANCE, MECHANICAL; LISSAJOUS FIGURES.
- Greenstein, Prof. Jesse L. *Mount Wilson and Palomar Observatories, California Institute of Technology.* MAGNITUDE, STELLAR; STAR; series of articles on various stars.
- Greep, Dr. Roy Orval. *Dean and Professor of Anatomy, Harvard School of Dental Medicine.* DIGESTIVE SYSTEM (in part).
- Gregg, Prof. James L. *Professor of Metallurgical Engineering, Cornell University.* ALLOY; HEAT-TREATMENT (METALS AND ALLOYS)—in part.
- Gregory, Dr. Alfred Thorne. *Consulting Engineer.* AIRCRAFT ENGINE PERFORMANCE.
- Gregory, Dr. Joseph T. *Professor of Paleontology and Curator of Lower Vertebrates in the Museum of Paleontology, University of California.* CROCODYLIA FOSSILS; DINOSAUR; articles on related fossil groups.
- Grey, Dr. David S. *Polaroid Corporation.* MICROSCOPE, REFLECTING (in part).
- Griffin, Dr. Donald R. *Professor, Rockefeller University.* MIGRATORY BEHAVIOR.
- Griggs, Prof. David T. *Institute of Geophysics, University of California.* ROCK MECHANICS.
- Grim, Dr. Ralph E. *Department of Geology, University of Illinois.* CLAY; CLAY MINERALS; articles on related minerals (all co-authored).
- Grinstead, Dr. Robert R. *Senior Research Chemist, Research Department, Dow Chemical Company.* IODINE (in part).
- Grobstein, Prof. Clifford. *Department of Biology, University of California, San Diego.* ANIMAL MORPHOGENESIS.
- Groggins, Philip Herkimer. *Former Senior Scientific Advisor, Chemical Division, Food Machinery and Chemical Corporation.* AMINATION; HYDROGENATION; HYDROLYTIC PROCESSES, articles on other unit processes.
- Gross, Prof. Paul Randolph. *Massachusetts Institute of Technology.* CELL ORGANIZATION.
- Gross, William H. *Metal Products Department, The Dow Chemical Company.* MAGNESIUM.
- Groves, Dr. Gordon W. *Instituto de Geofísica, Universidad Nacional de México.* TIDE.
- Gruen, Dr. Dieter M. *Argonne National Laboratory.* MAGNETOCHEMISTRY.
- Grundfest, Prof. Harry. *Professor of Neurology, College of Physicians and Surgeons, Columbia University.* ELECTRIC ORGAN (BIOLOGY); EPHAPTIC TRANSMISSION; SYNAPTIC TRANSMISSION.
- Grüneberg, Prof. Hans. *Professor of Genetics, University of London.* EXPRESSIVITY, GENE; PENETRANCE, GENE; PLEIOTROPISM.
- Guirard, Dr. Beverly Marie. *Department of Biochemistry, University of California.* BIOASSAY (in part).
- Guisse, Prof. Cedric Hay. *Professor emeritus of Forestry, Cornell University.* FORESTRY, FARM.
- Gulbransen, Dr. Earl Alfred. *Westinghouse Research Laboratories.* CORROSION (in part).
- Gunckel, Prof. James E. *Department of Botany, Rutgers University.* BUDDING; GRAFTING OF PLANTS; STEM (BOTANY)—in part; STEM CUTTINGS.
- Gunkler, Dr. Albert Arthur. *Technical Director, Inorganic Chemicals Research, Midland Division, Dow Chemical Company.* BROMINE; HALOGEN ELEMENTS.
- Gurney, Dr. Ashley B. *Entomology Research Division, U.S. Department of Agriculture.* PSYCOPTERA; ZORAPTERA.

## H

Gutzwiller, Dr. F. W. *General Electric Company, Semiconductor Products Department, Auburn, New York.* SILICON-CONTROLLED RECTIFIER.

Guy, Raymond F. *Consulting Engineer.* RADIO; TELEVISION; related articles on radio and television.

Haddock, Prof. Fred T. *Department of Astronomy and Department of Electrical Engineering, University of Michigan.* RADIO ASTRONOMY; RADIO TELESCOPE.

Hader, Rodney N. *Executive Assistant to Director of Publications, American Chemical Society.* AGRICULTURAL CHEMISTRY.

Hadler, Jacques B. *Head, Ship Powering Division, David Taylor Model Basin, Washington, D.C.* TOWING TANK.

Hadley, Dr. Elbert Hamilton. *Professor of Chemistry, Southern Illinois University.* Series of articles on organic chemistry.

Hadorn, Prof. Dr. Ernst. *Professor of Zoology and Comparative Anatomy, University of Zürich, Switzerland.* GENE ACTION (in part).

Haensel, Dr. Vladimir. *Vice-President and Director of Research, Universal Oil Products Company.* REFORMING (PETROLEUM REFINING).

Hagen, Dr. John Peter. *Department of Astronomy, The Pennsylvania State University.* BALLISTICS, EXTERIOR; SATELLITE, ARTIFICIAL; SPACE STATION, other articles on engineering and physics.

Hagner, Dr. Arthur F. *Professor of Geology, University of Illinois.* ORE AND MINERAL DEPOSITS.

Hahn, Dr. John F. *Associate Professor of Psychology, University of Virginia.* PSYCHOPHYSICAL METHODS; SENSATION.

Haines, John Elliott. *Vice-President, Minneapolis-Honeywell Regulator Company.* HUMIDISTAT.

Hainsworth, Bruce D. *Assistant to Director of Research, The Foxboro Company.* PRESSURE MEASUREMENT, VACUUM MEASUREMENT; other articles on pressure and vacuum instrumentation.

Hale, Dr. Mason E. *Smithsonian Institution.* ASCOLICHENES; BASIDIOLICHENES; LICHENES; LICHENES IMPERFECTI; articles on other groups of Lichenes.

Hales, Dr. Milton Reynolds. *Associate Professor of Pathology, Yale University School of Medicine.* GALLBLADDER DISORDERS; GASTROINTESTINAL TRACT DISORDERS; LIVER DISORDERS; PANCREAS DISORDERS.

Haley, Prof. Eleanor Day. *Associate Professor, Department of Microbiology, Yale University; Director, Nancy Sayles Day Mycology Laboratories, Yale-New Haven Medical Center.* MYCOLOGY, MEDICAL; other articles on mycotic infections.

Halkias, Dr. Christos C. *Assistant Professor of Electrical Engineering, Columbia University.* BIAS (TRANSISTOR); EMITTER FOLLOWER; NEGATIVE-RESISTANCE DEVICES; PULSE TRANSFORMERS.

Hall, Dr. Carl William. *Department of Agricultural Engineering, Michigan State University.* AGRICULTURAL SOIL AND CROP PRACTICES (in part).

Hall, Dr. Edmund K. *Former Professor of Anatomy, School of Medicine, University of Louisville.* EAR.

Hall, Dr. Richard P. *Professor of Biology, New York University.* PROTOZOA, articles on related taxonomic groups.

Halpern, Dr. J. *Professor of Chemistry, University of Chicago.* GOLD METALLURGY; SILVER METALLURGY.

Halvorson, Dr. Harlyn O. *Department of Bacteriology, University of Wisconsin.* BACTERIAL ENDOSPORES.

Halvorson, Prof. H. Orin. *Director, School of Life Sciences, University of Illinois.* FOOD PRESERVATION.

Hamer, Dr. Walter J. *Chief, Electrochemistry Section, National Bureau of Standards.* ELECTROMOTIVE FORCE (CELLS); other articles on electrochemistry.

Hamilton, Dr. Edwin L. *U.S. Navy Electronics Laboratory, San Diego.* OCEANIC ISLANDS; SEAMOUNT AND GUYOT (both in part).

- Hamilton, Dr. Howard L. Professor of Biology, University of Virginia. COELOM; METAMERISM, EMBRYONIC; NEURULATION; PRIMITIVE GUT.*
- Hammel, Dr. Edward Frederic. Group Leader, Los Alamos Scientific Laboratory. CRYOGENIC ENGINEERING; CRYOGENICS; LIQUEFACTION OF GASES; LOW-TEMPERATURE THERMOMETRY.*
- Hammond, Edwin Hughes. Professor of Geography, Syracuse University. HILL AND MOUNTAIN TERRAIN; PLAINS; other articles on terrain areas.*
- Hand, Dr. Cadet. Department of Zoology, University of California. COELENTERATA; CORALLIMORPHARIA; PTYCHODACTARIA; RADIATA.*
- Handler, Prof. Philip. Department of Biochemistry, Duke University. NITROGEN EXCRETION.*
- Hansen, Dr. Arthur Gene. Professor of Mechanical Engineering, University of Michigan. DYNAMIC SIMILARITY; STREAMLINE FLOW; STREAMLINING (in part).*
- Hanson, Allen Louis. Professor of Chemistry, St. Olaf College, Minnesota. Series of articles on various topics in chemistry.*
- Hanson, Frederick R. Research Associate, The Upjohn Company. ERYTHROMYCIN.*
- Harary, Prof. Frank. Department of Mathematics, University of Michigan. GRAPH THEORY.*
- Hardgrove, Ralph M. Sales Engineer, Stock Equipment Company, Cleveland, Ohio. CRUSHING AND PULVERIZING; FURNACE (STEAM GENERATING); other articles on mills and furnaces.*
- Harding, Prof. Clifford Vincent. Assistant Professor of Physiology, College of Physicians and Surgeons, Columbia University. PROTOPLASM (in part).*
- Harding, Dr. John Philip. Keeper of Zoology, British Museum of Natural History, London, England. CIADOCERA.*
- Harford, Edward Frederick. Consultant, Fabrics and Finishes Department, E. I. du Pont de Nemours and Company. ANTI-FREEZE MIXTURE.*
- Hargis, Dr. William J., Jr. Director, Virginia Institute of Marine Science; Dean, School of Marine Science, and Professor of Marine Science, College of William and Mary; Chairman, Department of Marine Science, and Professor of Marine Science, University of Virginia. ASPIDOGASTREA; MONOGENEA; TREMATODA.*
- Harker, Dr. Robert Ian. Research Petrologist, Johns-Manville Research Center, New Jersey. CALCITE; other articles on carbonate minerals.*
- Harleman, Dr. Donald Robert F. Professor of Civil Engineering, Massachusetts Institute of Technology. HYDRAULIC ANALOG TABLE, RIPPLE TANK; WAVE MOTION IN LIQUIDS; other articles on hydraulics.*
- Harned, Roger Lee. Research Microbiologist, Commercial Solvents Corporation. CYCLOSERINE.*
- Harrar, Dr. J. George. President, The Rockefeller Foundation. BANANA; PLANT DISEASE CONTROL (both in part).*
- Harris, Dr. Cyril Manton. Professor of Electrical Engineering and Architecture, Columbia University. ABSORPTION (SOUND); ARCHITECTURAL ACOUSTICS; NOISE CONTROL IN BUILDINGS; other articles on acoustics.*
- Harris, Dr. Forest K. National Bureau of Standards. CURRENT BALANCE; GALVANOMETER (in part).*
- Harris, Dr. Harry. Reader in Biochemical Genetics, University of London, England. HUMAN GENETICS (in part).*
- Harrison, Dr. George R. Dean emeritus, School of Science, Massachusetts Institute of Technology. DIFFRACTION GRATING.*
- Harrison, Henry Turner. Director of Meteorology, United Air Lines Operating Base, Stapleton Airfield, Denver. AEROLOGY; AERONAUTICAL METEOROLOGY.*

- Harrison, Louis P.** *Techniques Development Laboratory, Systems Development Office, U.S. Weather Bureau, Environmental Science Services Administration, U.S. Department of Commerce.* AIR PRESSURE; ATMOSPHERIC HIGH; ATMOSPHERIC LOW; ISOBAR.
- Harrow, Dr. Benjamin** (Formerly) *Department of Chemistry, College of City of New York.* DISEASE (in part).
- Harsh, M. Duffield.** *Engineering Leader, Electron Tube Division, Radio Corporation of America.* CATHODE-RAY TUBE; STORAGE TUBE.
- Harsha, Wayne V.** *Editor, 'The Inland and American Printer and Lithographer.'* COMPOSITION (TYPE).
- Hart, Dr. Helen.** *Department of Plant Pathology and Botany, University of Minnesota.* PLANT DISEASE CONTROL (in part).
- Hart, Dr. Jackson Sanford.** *Head, Animal Physiology Section, Division of Applied Biology, National Research Council, Canada.* THERMOREGULATION.
- Hartman, Dr. Lawton M.** (Formerly) *Philco Corporation, Research Division.* COMMUNICATIONS SATELLITE.
- Hartman, Dr. Olga.** *Auan Hancock Foundation, University of Southern California.* ANNELIDA; ARCHIANNELIDA; POLYCHAETA.
- Hartman, Dr. Willard D.** *Associate Professor of Biology and Curator of Invertebrate Zoology, Peabody Museum of Natural History, Yale University.* PARAZOA; PORIFERA; articles on related taxonomic groups.
- Hartsuch, Prof. Bruce Edwin** *Former Associate Professor emeritus of Chemistry, Michigan State University.* BLEACHING.
- Hartung, Dr. Walter H.** *Former Professor of Pharmaceutical Chemistry, Medical College of Virginia.* PHARMACEUTICAL CHEMISTRY.
- Harvey, Dr. E. Newton.** *Former Henry Fairfield Osborn Professor of Biology, Princeton University.* BIOLUMINESCENCE; MICROSCOPE; CENTRIFUGE.
- Hasche, Dr. R. L.** (Formerly) *Hasche Engineering Company, Johnson City, Tennessee.* FULL GAS SUPPLEMENTS.
- Haskins, Dr. Reginald H.** *Head, Physiology and Biochemistry of Fungi Section, National Research Council, Prairie Regional Laboratory, Canada.* INDUSTRIAL MICROBIOLOGY.
- Hass, Dr. Henry Bohn** *Director of Chemical Research, M. W. Kellogg Company.* SODIUM.
- Hass, Mr. William A.** *U.S. Weather Bureau, Office of Meteorological Research.* STORM DETECTION.
- Hassialis, Dr. Menelaos Dimitri.** *Krumb Professor of Mining and Executive Officer of The Henry Krumb School of Mines, Columbia University.* ORE DRESSING.
- Hassid, Prof. William Z.** *Department of Biochemistry, University of California, Berkeley.* CARBOHYDRATE; series of articles on carbohydrates.
- Hastings, Prof. J. Woodland.** *Biochemistry Division, University of Illinois.* BIOLUMINESCENCE.
- Hatai, Dr. Prof. Kotora.** *Professor of Historical Geology, Institute of Geology and Paleontology, Faculty of Science, Tohoku University, Japan.* BRACHIOPODA; articles on related taxonomic groups.
- Hauf, Dean Harold D.** *University of Southern California.* ARCHITECTURAL ENGINEERING.
- Hausman, Dr. Eugene Arnold.** *Former Research Chemist, Engelhard Industries, Inc.* IRIIDIUM; OSMIUM; PLATINUM.
- Hausner, Henry H.** *Consulting Engineer.* CERMET; INTERMETALLIC COMPOUNDS.
- Havighorst, Carl Rousseau.** *Western Editor of 'Chemical Engineering' and 'Chemical Week' Magazines.* FOOD ENGINEERING (in part).
- Hawkins, Dr. Arthur.** *Professor of Agronomy, University of Connecticut.* POTATO, IRISH (in part).

- Hawkins, George Andrew. *Dean of Engineering, Purdue University*. HEAT BALANCE; THERMODYNAMIC PRINCIPLES; series of related articles.
- Haynes, David Oliphant. *Consulting Industrial Engineer*. BULK-HANDLING MACHINES; CONVEYING MACHINES; INDUSTRIAL TRUCKS; other articles on industrial engineering.
- Haynes, Dr. William Clarence. *Principal Bacteriologist, A.R.S. Culture Collection, Northern Utilization Research and Development Division, U.S. Department of Agriculture*. PSEUDOMONADACEAE; PSEUDOMONADALES; PSEUDOMONADINIAE.
- Hazen, Prof. David C. *Forrestal Research Center, Princeton University*. AIRPLANE; KITE.
- Hazen, Richard. *Partner, Hazen and Sawyer, New York*. RESERVOIR; WATER SUPPLY ENGINEERING; WATER TREATMENT.
- Hazen, Ronald McKean. *Consultant (retired)*. AIRCRAFT ENGINE; AIRCRAFT ENGINE, RECIPROCATING.
- Hearmon, R. F. S. *Timber Mechanics Section, Forest Products Research Laboratory, England*. ANELASTICITY; ELASTICITY; PLASTICITY.
- Hecht, Prof. Hans H. *Department of Medicine, University of Chicago*. ELECTROCARDIOGRAPHY; ELECTROPHYSIOLOGY (HEART); PHONOCARDIOGRAPHY; VECTORCARDIOGRAPHY.
- Hedberg, Dr. Hollis D. *Department of Geology, Princeton University*. PROSPECTING, PETROLEUM (in part).
- Hedgpeth, Prof. Joel W. *Oregon State University, Marine Science Laboratory, Newport, Oregon*. PALAEOISOPUS; PYGNOGONIDA.
- Heezen, Dr. Bruce C. *Lamont Geological Observatory, Columbia University*. MARINE SEDIMENTS; OCEAN CURRENTS; SUBMARINE TOPOGRAPHY (all in part); TURBIDITY CURRENT.
- Heidt, Prof. Lawrence J. *Department of Chemistry, Massachusetts Institute of Technology*. PHOTOCHEMISTRY.
- Heilbrunn, Dr. L. V. (Formerly) *Department of Zoology, University of Pennsylvania*. CENTRIFUGATION.
- Heinrich, Dr. Charles. *Professor and Chairman, Department of Botany, Miami University*. ROOT (BOTANY)—in part.
- Heinrich, Prof. E. William. *Mineralogical Laboratory, University of Michigan*. MICA; PETROLOGY; ROCK, series of related articles.
- Heiskanen, Dr. Weikko A. *Professor emeritus of the Department of Geodetic Science, Ohio State University; Director of the Finnish Geodetic Institute (retired), Helsinki, Finland*. GEODESY; POLAR WANDERING; TERRESTRIAL FORCE FIELDS, TERRESTRIAL GRAVITATION.
- Hela, Prof. Ilmo. *Director, Institute of Marine Research, Finland*. BALTIC SEA.
- Helmers, Dr. Carl J. *Director, Development Division, Research and Development Department, Phillips Petroleum Company*. CARBON BLACK.
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- Hendrickson, Prof. H. M. (Formerly) *Department of Mechanical Engineering, University of Washington*. DRY ICE; REFRIGERATION; REFRIGERATOR; series of related articles.
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- Henney, Keith. *McGraw-Hill Book Company*. CIRCUIT, ELECTRONIC (in part); ELECTRONICS.
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- Herb, Prof. Raymond G. *Department of Physics, University of Wisconsin*. COCKCROFT-WALTON ACCELERATOR; RESONANCE TRANSFORMER; VAN DE GRAAFF GENERATOR.
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- Herskind, C. C. *Senior Application Engineer, Electric Utility Engineering Operation, General Electric Company*. EXCITRON; IGNITRON; MERCURY-VAPOR RECTIFIER.
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- Hill, Dr. Howard Rice. (Formerly) *Los Angeles County Museum*. CYPHALOBAENIDA; PENTASTOMIDA; POROCEPHALIDA.
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- Hoch, Fred W. *President, Fred W. Hoch Associates, Inc.; Graphic Arts Methods and Management Consultant*. PRINTING PRESS.
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- Knight, Dr. Samuel Bradley. *Professor of Chemistry, University of North Carolina.* HYDROGEN ION (in part).
- Knoert, Alvin W. *Editor, 'Engineering and Mining Journal.'* METAL AND MINING PROCESSING.
- Knopf, Dr. Eleanora Bliss. *Research Associate, School of Mineral Sciences, Stanford University.* CLEAVAGE, ROCK; PETROFABRIC ANALYSIS; SCHISTOSITY, ROCK; STRUCTURAL PETROLOGY.
- Knowles, Hugh S. *Director of Research, Industrial Research Products, Inc.* LOUDSPEAKER.
- Knowlton, P. Holland. *Large Steam Turbine Generator Department, General Electric Company (retired).* STEAM TURBINE; TURBINE.
- Koch, Leonard J. *Director, Reactor Engineering Division, Argonne National Laboratory.* ELECTROMAGNETIC PUMPS; REACTOR, NUCLEAR.
- Kochendorfer, Fied D. *Manager, Communications Satellite Program, Philco WDL.* NOZZLE.
- Koczy, Prof. Friedrich. *Professor of Marine Sciences, The Institute of Marine Science, University of Miami.* OCEANOGRAPHY (in part).
- Koerker, Frederick William. *Technical Expert, The Dow Chemical Company.* CHLORINE.
- Kohl, Arthur L. *Group Leader, Process Development, Atomics International, Division of North American Aviation, Inc.* HUMIDIFICATION; STRIPPING.
- Kohls, Glenn M. *Sanitarian Director, U.S. Public Health Service, Rocky Mountain Laboratory, Hamilton, Montana.* IXODIDES.
- Komai, Dr. Taku. *Professor emeritus, Kyoto University, Japan.* CTENOPHORA; articles on related taxonomic groups.
- Konigsbert, Dr. Irwin R. *University of Colorado School of Medicine.* PANCREAS (in part).
- Konzo, Prof. Seichi. *Mechanical Engineering Department, University of Illinois.* REGISTER, AIR; WARM AIR HEATING SYSTEM.
- Kopac, Prof. M. J. *Department of Biology, New York University.* MICROMANIPULATION.

- Kopal, Prof. Zdeněk. *Head, Department of Astronomy, University of Manchester, England.* BINARY STARS.
- Kornemann, Henry C. *Assistant Manager, Engineering Laboratory, Linde Company.* ATMOSPHERIC GASES; PRODUCTION OF.
- Kott, Dr. Maurice G. *Director, Division of Mental Retardation, Department Institutions and Agencies, State of New Jersey.* CRETINISM; MENTAL DEFICIENCY; MONGOLOID IDIOCY; PHENYLPIRUVIC OLIGOPHRENIA.
- Kotter, Dr. F. Ralph. *Physicist, National Bureau of Standards.* CAPACITANCE BOX; CAPACITANCE MEASUREMENT.
- Kraehenbuehl, Prof. John Otto. *Professor emeritus of Engineering, Colorado College.* ARC LAMP; INCANDESCENT LAMP; INFRARED LAMP; PHOTOFLASH LAMP.
- Krause, Lloyd N. *Aeronautical Research Scientist, Instruments, National Aeronautics and Space Administration, Lewis Research Center.* PITOT TUBE.
- Krefeld, Prof. William J. *Professor emeritus of Civil Engineering, Columbia University.* LOADING, TRANSVERSE, STRESS AND STRAIN; STRUCTURAL CONNECTIONS; other articles on civil engineering.
- Kreitlow, Dr. Kermit William. *Assistant Chief, Forage and Range Research Branch, Crops Research Division, A.R.S., U.S. Department of Agriculture Beltsville, Maryland.* CLOVER; GRASS CROPS (both in part).
- Kret, David B. *Project Engineer, Semiconductor Division, Motorola, Inc.* PHOTOELECTRIC DEVICES.
- Krishna, Kumari. *Department of Entomology, American Museum of Natural History.* SOCIAL INSECTS.
- Kronbach, Dr. Karl V. *Insect Identification and Parasite Introduction Branch, Entomology Research Division, U.S. Department of Agriculture.* HYMENOPTERA.
- Kunhsein, Dr. William C. *Department of Geology, Northwestern University.* FACIES (GEOLOGY).
- Krisen, Dr. Frank Hammond. *Professor and Coordinator of Physical Medicine and Rehabilitation, Temple University School of Medicine.* THERMOTHERAPY (in part).
- Krynine, Prof. Dimitri P. *ENGINEERING GEOLOGY (in part).*
- Kryter, Dr. Karl D. *Head, Sensory Sciences Group, Stanford Research Institute.* EAR PROTECTORS; NOISE CONTROL (in part); PHON; other articles on acoustics.
- Kuhn, Dr. Wayne E. *Professional Engineer.* DEWAXING (PETROLEUM); WAX, PETROLEUM.
- Kuiper, Prof. Gerard P. *Director, Lunar and Planetary Laboratory, University of Arizona.* APOGEE; MOON; PERIGEE; PHASE (ASTRONOMY).
- Kullas, Albert J. *Director, Research and Engineering, Martin Company, Denver Division.* WING STRUCTURE.
- Kullerud, Dr. Gunnar. *Geochemist, Geophysical Laboratory, Carnegie Institution of Washington.* SULFIDE PHASE EQUILIBRIA.
- Kulp, Dr. J. Lawrence. *Professor of Geochemistry, Columbia University.* COSMOCHEMISTRY; GEOCHEMISTRY; GEOCHRONOMETRY; GEOLOGICAL TIME SCALE; ROCK (AGE DETERMINATION).
- Kummel, Prof. Bernhard. *Museum of Comparative Zoology, Harvard University.* TRIASSIC.
- Kunin, Dr. Robert. *Rohm and Haas Company.* ION-PERMEABLE MEMBRANE (in part).
- Kunkel, Prof. Henry G. *The Rockefeller Institute.* BLOOD (in part).
- Kunz, Dr. Kaiser S. *Research Professor of Electrical Engineering, New Mexico State University.* CURVE FITTING; EXTRAPOLATION; GRAPHIC METHODS; INTERPOLATION.
- Kupchan, Prof. S. Morris. *Professor of Pharmaceutical Chemistry, University of Wisconsin.* ALKALOID; articles on various alkaloids.
- Kurtz, Stewart S., Jr. *Sun Oil Company.* OIL ANALYSIS.

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- Kusch, Prof. Polykarp. *Department of Physics, Columbia University*. ELECTRON SPIN; MOLECULAR BEAMS; other articles on atomic and molecular physics.
- Lackey, Prof. James B. *Professor of Sanitary Science, Department of Civil Engineering, University of Florida*. MASTIGOPHORA; articles on related taxonomic groups.
- Ladd, Dr. Harry S. *U.S. Geological Survey*. ATOLL; PALEOECOLOGICAL.
- LaFond, Dr. Eugene C. *Head, Marine Environment Division, U.S. Navy Electronics Laboratory, San Diego, California*. UPWELLING.
- Lagler, Prof. Karl Frank. *School of Natural Resources, University of Michigan*. FISHERIES CONSERVATION.
- Lamanna, Dr. Carl. *Deputy and Scientific Advisor, Life Sciences Division, Office of the Chief of Research and Development, Department of the Army*. ANTIBACTERIAL AGENTS (in part).
- Lamar John E. *Geologist, Illinois State Geological Survey*. SAND.
- Landauer, Dr. Walter. *Nuffield Institute, London, England*. PHENOCOPIES.
- Landes, Dr. Hugh Stevenson. *Associate Professor of Electrical Engineering, University of Virginia*. RECIPROCITY, PRINCIPLE OF.
- Landshoff, Dr. Rolf K. M. *Lockheed Missiles and Space Company*. COSMIC ELECTRODYNAMICS; MAGNETOHYDRODYNAMICS.
- Landweber, Prof. Louis. *Professor of Mechanics and Hydraulics, State University of Iowa*. HYDRODYNAMICS; HYDROKINEMATICS; HYDROKINETICS.
- Lane, James Arthur. *Oak Ridge National Laboratory*. NUCLEAR FUELS; NUCLEAR POWER.
- Lang, Dr. Prof. Karl G. H. *Director of the Department of Invertebrates, Swedish State Museum of Natural History, Stockholm, Sweden*. HARPACTICOIDA; TANAIIDACEA.
- Langley, Dr. Leroy Lester. *Professor of Physiology, University of Alabama Medical Center*. DIGESTIVE SYSTEM (in part).
- Lankton, Clark S., Jr. *Aircraft Nuclear Propulsion Department, General Electric Company*. NUCLEAR AIRCRAFT PROPULSION (in part).
- Lapedes, Daniel N. *Managing Editor, McGraw-Hill Encyclopedia of Science and Technology*. INFECTION. PATHOGEN; articles on several enzymes.
- Lapidus, Prof. Leon. *Department of Chemical Engineering, Princeton University*. CHEMICAL PROCESS CONTROL.
- Laport, Edmund Abner. *Director, Communications Engineering, Radio Corporation of America*. AMPLITUDE-MODULATION RADIO; FREQUENCY-MODULATION RADIO.
- Lapple, Charles E. *Senior Scientist, Stanford Research Institute*. DUST AND MIST COLLECTION; PARTICLE PROPERTIES.
- Larsen, Prof. Edwin Merritt. *Department of Chemistry, University of Wisconsin*. INDIUM; NIOBIUM; TANTALUM; THALLIUM.
- Larsen, Dr. Helge. *Professor of Biochemistry, The Technical University of Norway*. BRINE, MICROBIOLOGY OF.
- Larsen, Dr. Robert Gordon. *Manager and Director of Research, Thornton Research Centre, Shell Research, Ltd., Chester, England*. LUBRICANT.
- Lass, Dr. Harry. *Research Specialist, Jet Propulsion Laboratory, California Institute of Technology*. CALCULUS OF TENSORS; CALCULUS OF VECTORS.
- Lauffer, Prof. Max A. *Andrew Mellon Professor of Biophysics; Chairman, Department of Biophysics, University of Pittsburgh*. BIOPHYSICS.
- Laves, Prof. Dr. Fritz Henning. *Eidgenoessisch Technische Hochschule und Universitaet Zuerich, Institut Fuer Kristallographie und Petrographie, Zurich, Switzerland*. FELDSPAR; articles on related minerals.
- Lawler, Frank K. *Editor-in-Chief, 'Food Engineering'*. FOOD ENGINEERING; FOOD MANUFACTURING (both in part); FOOD TECHNOLOGY.



- Lawroski, Dr. Stephen. *Associate Laboratory Director, Argonne National Laboratory.* NUCLEAR FUELS REPROCESSING; RADIO-CHEMICAL LABORATORY.
- Lawther, Dr. Harry Preston, Jr. *General Engineering Department, Southwestern Bell Telephone Company (retired).* CROSSTALK.
- Layzer, Prof. David. *Professor of Astronomy, Harvard University.* COSMOGONY; COSMOLOGY; STELLAR EVOLUTION; other articles on astronomy.
- Lazarus, Prof. David. *Professor of Physics, University of Illinois.* DIFFUSION IN SOLIDS.
- Leadon, Dr. Bernard M. *Senior Staff Scientist, Convair.* SKIN FRICTION.
- Ledingham, Dr. George Aleck. *Former Director, Prairie Regional Laboratory, Saskatoon, Canada.* 2,3-BUTANEDIOL.
- Ledoux, Louis P. *Ledoux and Company, Teaneck, New Jersey.* ASSAYING (in part).
- Lee, Harold Eugene. *Vice-President, The Bunker Hill Company.* LEAD METALLURGY.
- Lee, Low K. *Associate Director, Product Assurance, TRW Inc., TRW Systems.* PRINTED CIRCUIT.
- Lehner, Prof. Derrick Henry. *University of California.* NUMBER SYSTEMS.
- Lehninger, Dr. A. L. *Johns Hopkins University School of Medicine.* CELL (BIOLOGICAL)—in part.
- Lehrman, Prof. Daniel S. *Institute of Animal Behavior, Rutgers University.* REPRODUCTIVE BEHAVIOR.
- Lein, Dr. Joseph. *Director of Research, International, Bristol Laboratories.* KANAMYCIN.
- Lems, Dr. Cornelius. *Assistant Professor of Biological Sciences, Goucher College, Baltimore.* ISLAND FAUNAS AND FLORAS; POPULATION DISPERSAL; SUCCESSION, ECOLOGICAL; other articles on ecology.
- Leontis, Dr. Thomas Ernest. *Metal Products Department, The Dow Chemical Company.* MAGNESIUM ALLOYS.
- Leopold, Prof. A. Carl. *Professor of Physiology of Horticultural Crops, Purdue University.* PLANT HORMONES.
- Leopold, Prof. A. Starker. *University of California.* BIOGEOGRAPHY.
- Leopold, Dr. Luna Bergele. *Chief Hydrologist, U.S. Geological Survey.* STREAM GAGING; STREAM TRANSPORT AND DEPOSITION; SURFACE WATER; SWAMP, MARSH, AND BOG.
- LePage, Dr. Wilbur R. *Chairman, Department of Electrical Engineering, Syracuse University.* CHOKER (FILTER); FILTER, ELECTRIC (in part); NOISE FILTER, RADIO; SUPPRESSOR.
- Lerch, William. *Consultant Portland Cement Association.* AIR-ENTRAINING PORTLAND CEMENT; CEMENT; PORTLAND CEMENT.
- Lettau, Dr. Heinz Helmut. *Professor of Meteorology and Civil Engineering, University of Wisconsin.* MICROMETEOROLOGY.
- Leubbers, Dr. Ralph H. *Professor of Chemical Engineering, University of Missouri.* HEAT TRANSFER.
- Leva, Max. *Consulting Chemical Engineer.* GAS ABSORPTION OPERATIONS.
- Levasheff, V. V. *Inorganic Section Group Leader, American Potash and Chemical Corporation.* BORON (in part).
- Levine, Dr. Philip. *Director, Division of Immunohematology, Ortho Research Foundation, Raritan, New Jersey.* BLOOD GROUPS.
- Levitt, Dr. I. M. *Director, The Fels Planetarium of The Franklin Institute.* PLANETARIUM.
- Lewis, Dr. Bernard. *Combustion and Explosives Research, Inc.* COMBUSTION.
- Lewis, Prof. Edward B. *Professor of Biology, California Institute of Technology.* ALLELE; PSEUDOALLELES.

- Lewis, Frank D. *Engineer, General Radio Company.* FREQUENCY COUNTER; FREQUENCY MEASUREMENTS (in part); PIEZOELECTRIC CRYSTAL; WAVELENGTH MEASUREMENT.
- Lewis, Dr. James C. *Research Chemist, Western Regional Laboratory, U.S. Department of Agriculture.* SUBTILIN.
- Lewis, Dr. Willard Deming. *President, Lehigh University.* SWITCHING THEORY.
- Ley, Dr. h. c. Willy. *Fairleigh Dickinson University.* BALLISTICS, INTERIOR.
- Li, Dr. C. C. *Professor of Biometry, Graduate School of Public Health, University of Pittsburgh.* BIOMETRICS; HUMAN GENETICS (in part); POPULATION GENETICS.
- Li, Prof. Choh Hao. *Director, Hormone Research Laboratory, University of California.* PANCREAS (in part); THYROID GLAND (in part); articles on various hormones.
- Libby, Prof. Willard Frank. *Formerly, member of Atomic Energy Commission; presently, Department of Chemistry, University of California.* RADIOACTIVE FALLOUT.
- Liddicoat, Richard Thomas, Jr. *Director, Gemological Institute of America.* GEM; GEM CUTTING; series of articles on various gems.
- Liedholm, George Edward. *Department Head (retired), Petroleum Processing, Shell Development Company.* ISOMERIZATION.
- Lill, Gordon G. *Office of Naval Research.* MOHO (MOHOROVICIC DISCONTINUITY).
- Liller, Dr. William. *Professor of Astronomy, Harvard University.* COAL SACK; GALAXY, THE; INTERSTELLAR MATTER; NEBULA.
- Limpel, Eugene J. *Consulting Electrical Engineer.* FLASH WELDING; RESISTANCE WELDING; SPOT WELDING.
- Lin, Dr. Shao-Chi. *Professor of Engineering Physics, University of California, San Diego.* SHOCK WAVE; SONIC BARRIER; SONIC BOOM; WAVE MOTION IN FLUIDS.
- Lindenmaier, Dr. Werner A. *Manufacturing Chemist, Hoffmann-LaRoche, Inc.* ASCORBIC ACID (in part).
- Linder, Fil. dr. Folke. *Flickläroverket, Hålsingborg, Sweden.* ANOSTRACA; BRANCHIOPODA; CONGHIOSTRACA; NOTOSTRACA.
- Linderoth, L. Sigfred, Jr. *Director of Engineering, Central Research and Engineering Division, Continental Can Company, Inc.* FLYWHEEL; SPRING (MECHANICAL); WELDED JOINT; other articles on machine design.
- Linford, Prof. Henry B. *Professor of Chemical Engineering, Columbia University.* ELECTROMETALLURGY.
- Linsley, Prof. E. Gorton. *Department of Entomology and Parasitology, University of California.* ANIMAL SYSTEMATICS; SPECIES CONCEPT; TYPE METHOD. other articles on animal systematics.
- Lippert, Thomas W. *Director of Marketing, Titanium Metals Corporation of America.* TITANIUM METALLURGY.
- Little, Elbert L., Jr. *Dendrologist, U.S. Forest Service, U.S. Department of Agriculture.* DENDROLOGY.
- Litynski, Z. *Library of Congress.* SATELLITE, ARTIFICIAL.
- Lobo, Walter E. *Consulting Chemical Engineer.* TUBE-STILL HEATER.
- Lochhead, Dr. Allan Grant. *Microbiology Research Institute, Canada Department of Agriculture.* SOIL MICROBIOLOGY; SOIL MICROORGANISMS; other articles on soil microbiology.
- Lockhart, Dr. Ernest E. *Scientific Director, Coffee Brewing Institute.* COFFEE (in part).
- Lockwood, Dr. Lewis B. *Assistant Director, Biosynthesis Laboratory, Miles Chemical Company.* ACETOBACTER SUBOXIDANS FERMENTATION; VINEGAR.
- Loeb, John L. *Deputy Project Manager, All-Weather Carrier Landing System Project Office, Bureau of Naval Weapons, Washington, D.C.* AUTOMATIC LANDING SYSTEM.
- Loewenstein, Dr. Werner R. *Associate Professor of Physiology, College of Physicians and Surgeons, Columbia University.* MECHANORECEPTORS.

- Lohrie, Ben. *President, Plasmakote Corporation*. METAL COATINGS (in part).
- Long, Prof. Franklin A. *Department of Chemistry, Cornell University*. ACID AND BASE.
- Longwell, Dr. Chester Ray. *Department of Geology, Stanford University*. DIASTROPHISM; GEOLOGY.
- Lord, Prof. Richard C. *Spectroscopy Laboratory, Massachusetts Institute of Technology*. INFRARED RADIATION; INFRARED SPECTROSCOPY; RAMAN EFFECT; other articles on optics.
- Lorenz, Prof. Edward N. *Department of Meteorology, Massachusetts Institute of Technology*. WEATHER (FORECASTING AND PREDICTION)- in part.
- Loughlin, James F. *Manager, Technical Service, National Aniline Division, Allied Chemical Corporation*. DYEING; TEXTILE PRINTING.
- Lowell, Wheeler G. *Research and Development Department, Ethyl Corporation*. ANTIKNOCK AGENTS.
- Lowan, Prof. Arnold N. *Chairman, Physics Department, Yeshiva University, Brooklyn, N. Y.* EXPONENT; LOGARITHM; NUMERICAL ANALYSIS.
- Lowell, Prof. Wayne Russell. *Department of Geology, Indiana University*. Series of articles on apatite and pyromorphite minerals.
- Lowenstam, Dr. Heinz A. *Geological Sciences, California Institute of Technology*. PALEOLOGY (GEOCHEMICAL ASPECTS).
- Lowenstein, Prof. Otto Egon. *Professor of Zoology, The University, Birmingham, England*. EQUILIBRIUM, BIOLOGICAL TAXIS.
- Lowenthal, Dr. David. *Research Associate, American Geographical Society*. WEST INDIES.
- Luckert, John Thomas. *Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville Parasitological Laboratory, Maryland*. ASCARIDOIDEA, articles on related taxonomic groups.
- Ludlam, Prof. Frank Henry. *Department of Meteorology, Imperial College, London, England*. CLOUD.
- Ludvik, Dr. George F. *Group Leader, Insecticide Application Research, Organic Chemicals Division, Monsanto Chemical Company*. INSECTICIDE; MITICIDE (both in part).
- Lundy, Clarence A. *Officer Engineer, Mechanical Department, New York Central Railroad System*. LOCOMOTIVE.
- Lush, Prof. Jay L. *Professor of Animal Husbandry, Iowa State University*. BREEDING (ANIMAL).
- Lush, Prof. R. H. *Dairying, University of Tennessee*. CATTLE PRODUCTION, DAIRY.
- Luttrell, Dr. E. S. *Head, Department of Plant Pathology, Georgia Experiment Station, University of Georgia*. GRAPE CULTURE (in part).
- Luzadder, Prof. Warren J. *Professor of Engineering Graphics, Purdue University*. BOLT; NUT; SCREW THREADS; WASHER.
- Lyman, Dr. Charles Peirson. *Assistant Professor of Anatomy, Harvard Medical School; Research Associate, Museum of Comparative Zoology, Harvard University*. HIBERNATION (in part).
- Lyman, Dr. John. *Oceanographer, Bureau of Commercial Fisheries*. MEDITERRANEAN SEA; OCEANS AND SEAS; SEA; SEA WATER (in part).
- Lynn, Dr. John W. *Assistant Director of Research and Development, Union Carbide Chemicals Company*. ALCOHOL; BUTANOL; METHANOL; PROPANOL.
- Lynn, Dr. William Gardner. *Professor of Biology, The Catholic University of America*. THYROID GLAND (in part).
- Lyon, Dr. Waldo K. *Head, Submarine and Arctic Research Branch, U.S. Navy Electronics Laboratory*. SEA ICE.
- Lyons, Prof. Walter. *Vice-President, Tele-Signal Corporation*. RADIO RECEIVER; RADIO TRANSMITTER; series of related articles.

- Mayall, Robert Newton. *Director, Planning and Research Associates, Boston.* SUNDIAL.
- Maydew, Randall C. *Manager, Aero and Thermodynamics Department, Sandia Corporation, Albuquerque, New Mexico.* WIND TUNNEL (in part).
- Mayer, Dr. Rudolph L. (Formerly) *Leonard Wood Memorial Hospital, Washington, D.C.* SULFA DRUGS.
- Mayerson, Prof. Hymen Samuel. *Professor emeritus of Physiology, Tulane University; Associate Director, Touro Infirmary, New Orleans.* CARDIOVASCULAR SYSTEM (in part).
- Maynard, Dr. Harold Bright. *President, Maynard Research Council, Inc.; Chairman of the Board, H. B. Maynard and Company, Inc.* METHODS ENGINEERING; METHODS STUDY; WORK MEASUREMENT.
- Mays, Rolland Lee. *Development Manager, Molecular Sieve Products, Linde Company, Division of Union Carbide Corporation.* MOLECULAR SIEVE (in part).
- Mazia, Prof. Daniel. *Department of Zoology, University of California.* CELL DIVISION; CYTOKINESIS.
- McBee, Prof. Earl T. *Department of Chemistry, Purdue University.* HALOGENATION (in part).
- McCabe, Dr. Warren L. *Professor, Department of Mechanical Engineering, North Carolina State University.* FILTRATION; LEACHING; SEPARATION (MECHANICAL); other articles on unit operations.
- McCally, Dr. Michael. *Aerospace Medical Research Laboratories, Wright-Patterson Air Force Base, Ohio.* SPACE BIOLOGY (in part).
- McCann, Dr. Mary B. *Department of Nutrition, Harvard School of Public Health.* COENZYME; METABOLISM.
- McClearn, Dr. Gerald Eugene. *Department of Psychology, University of Colorado.* BEHAVIOR AND HEREDITY.
- McCleary, Prof. Robert A. *Department of Psychology, University of Chicago.* BODY RHYTHM; HUNGER; SLEEP; other articles on body rhythm.
- McClellan, Leslie Newinan. *Consulting Engineer, Engineering Consultants, Inc., Denver, Colorado.* CANAL, DAM, PIPELINE.
- McClung, Dr. Leland S. *Professor of Bacteriology, Chairman of Department, Assistant Director, Division of Biological Sciences, Indiana University.* BLACKLEG; BOTULISM; GANGRENE, GAS; TETANUS.
- McConnaughey, Dr. Bayard H. *Department of Biology, University of Oregon.* DIGYEMIDA, MENOZOEA, ORTHONECTIDA.
- McConnick, Dr. J. R. D. *Lederle Laboratories.* DEMETHYL-CHLORTETRACYCLINE.
- McConnick, Dr. Jack. *Chairman, Department of Ecology and Land Management, The Academy of Natural Sciences of Philadelphia.* TERRESTRIAL ECOSYSTEM; VEGETATION ZONES.
- McCrea, Prof. John F. *Associate Professor of Biophysics, Yale University.* HYALURONIDASE.
- McCrosky, Dr. Richard Eugene. *Astronomer, Smithsonian Astrophysical Observatory.* COMET; METEOR.
- McCutcheon, Prof. F. Harold. *Professor of Physiology, University of Pennsylvania.* RESPIRATORY SYSTEM (in part).
- McElroy, Dennis L. *Board of Directors, Consolidation Coal Company.* COAL MINING.
- McElroy, Prof. William D. *Chairman, Department of Biology, Johns Hopkins University.* BACTERIAL LUMINESCENCE.
- McEwen, Prof. Robert Stanley. *Professor emeritus, Oberlin College.* RESPIRATORY SYSTEM (in part).
- McFarland, Forest. *Consulting Engineer.* GEAR LOADING; OVER-DRIVE; TRANSMISSION, AUTOMOTIVE; other articles on mechanical power.
- McGrain, Preston. *Assistant State Geologist, Kentucky Geological Survey, University of Kentucky.* OIL-FIELD WATERS.

- McGraw, Dr. Leslie D. *Division Chief, Basic Process Research, Research and Development Department, National Steel Corporation.* ELECTROCHEMICAL PROCESS (in part).
- McHugh, Fred Devereux. *Engineer (retired) and Former Executive Editor of 'Scientific American.'* ARMAMENT, ARMY (in part).
- McKee, Andrew Irwin. *Rear Admiral (retired), U.S. Navy; Former Vice-President, General Dynamics Corporation, and Director of Research and Design, Electric Boat Division.* SUBMARINE.
- McKenna, Dr. Malcolm C. *Associate Curator of Fossil Vertebrates, American Museum of Natural History; Associate Professor of Geology, Columbia University.* DERMOPTERA FOSSILS; INSECTIVORA FOSSILS; articles on other fossil forms.
- McKenzie, Alexander Anderson. *Assistant Editorial Adviser, Technical Writing Service, McGraw-Hill Book Company.* DECCA; DECTRA; HYPERBOLIC NAVIGATION SYSTEM; LORAN.
- McKetta, Dr. John J. *Graduate Professor, Department of Chemical Engineering, and Dean of Engineering, University of Texas.* PETROLEUM PROCESSING.
- McKusick, Dr. Victor Almon. *Professor of Medicine, Johns Hopkins University School of Medicine.* HUMAN GENETICS (in part).
- McLaughlin, Dr. John Joseph A. *Haykins Laboratories, Saint Francis College, Brooklyn.* AXENIC CULTURE.
- McLean, Dr. Franklin C. *Professor emeritus of Physiology, University of Chicago.* SKELETAL SYSTEM (in part).
- McMath, Prof. Robert R. *Former Director, McMath-Hulbert Observatory, University of Michigan.* CORONAGRAPH; SPECTROHELIOSCOPE; TELESCOPE, ASTRONOMICAL.
- McMillen, Wheeler. *Vice-President, Farm Journal, Inc.; Chairman of Board, The Chemurgic Council.* CHEMURGY.
- McNitt, Capt. Robert Waring. *U.S. Navy.* ARMAMENT, NAVAL.
- McQuarrie, Dr. Malcolm Caven. *Patent Attorney, Ceramist Patent Department, Kaiser Aluminum and Chemical Corporation.* CERAMIC TECHNOLOGY; GLASS AND GLASS PRODUCTS; REFRACTOR. Series of related articles.
- Medawar, Dr. Peter B. *Director, National Institute for Medical Research, London.* IMMUNOLOGICAL TOLERANCE, ACQUIRED.
- Meeme, Harry J. *Head Engineer, Landing Ships, Craft and Boats, Bureau of Ships, U.S. Navy.* LANDING SHIPS AND CRAFT.
- Meggers, Dr. William Frederick. *National Bureau of Standards.* ELECTRON CONFIGURATION (in part); SPECTROSCOPY, WAVELENGTH STANDARDS; other articles on spectroscopy.
- Meigs, Dr. Peveril. *Geographer (retired).* ENVIRONMENTAL PROTECTION.
- Meiklejohn, Dr. Jane. *Senior Research Fellow, University College, Salisbury, Rhodesia.* METHANOMONADACEAE; NITROBACTERIACEAE; SOIL MINERAL (MICROBIAL UTILIZATION); other articles on soil microbial cycles.
- Meinke, Prof. William Wayne. *Analytical Chemistry Division, National Bureau of Standards, Washington, D.C.* ACTIVATION ANALYSIS; RADIOISOTOPE (ASSAY); RADIOMETRIC ASSAY.
- Meister, Prof. Alton. *Department of Biochemistry, Tufts University School of Medicine.* ENZYME (in part).
- Meixner, Prof. Dr. Josef. *Director, Institute of Theoretical Physics, Technische Hochschule, Aachen, Germany.* BESSEL FUNCTIONS; BETA FUNCTION; GAMMA FUNCTION.
- Mellon, Prof. M. G. *Department of Chemistry, Purdue University.* OPAQUE MEDIUM; TRANSLUCENT MEDIUM; TRANSPARENT MEDIUM.
- Mellors, Dr. Robert Charles. *Professor of Pathology, Director of Laboratories, Associate Director of Research, Hospital for Special Surgery, affiliated with the New York Hospital-Cornell University Medical College.* MICROSCOPE, FLUORESCENCE (in part).

- Melnick, Prof. Joseph L. *Chairman, Department of Virology and Epidemiology, Baylor University College of Medicine.* ANIMAL VIRUS; INTERFERON; series of articles on virus methodology and infections.
- Menard, Dr. Henry W., Jr. *Scripps Institution of Oceanography.* OCEANIC ISLANDS; SEAMOUNT AND GUYOT (both in part).
- Menetrey, Dr. Walter R. *Electro-Optical Systems, Inc., Pasadena, California.* SPACE POWER SYSTEMS.
- Menzel, Prof. Donald Howard *Director, Harvard College Observatory.* ASTRONOMY; FLYING SAUCERS.
- Menzies, Dr. Robert James. *Research Associate, Biology Department, University of Southern California.* ASELOTA; ISOPODA.
- Mercanton, Dr. Roger A. *Hoffmann-LaRoche, Inc.* BIOTIN (in part).
- Merrill, Charles White. *Chief, Division of Minerals, Bureau of Mines, U.S. Department of Interior.* MINING.
- McIrill, Timothy W. *Director of Product Research, Vanadium Corporation of America.* VANADIUM
- Merritt, Frederick S. *Partner, Warsaw-Merritt Associates, Consulting Engineers, Syosset, New York.* CONCRETE BEAM; PRESTRESSED CONCRETE; other articles on concrete usage.
- Mertle, Joseph S. *Former Photomechanical Consultant, Minnesota Mining and Manufacturing Company.* PRINTING PLATE (in part).
- Meszar, John. *Director (retired), Switching Systems Development, Bell Telephone Laboratories, Inc.* COUNTING CIRCUIT; SWITCHING CIRCUIT.
- Meyer, Dr. Bernard S. *Professor and Chairman, Department of Botany and Plant Pathology, Ohio State University.* AUXIN; PLANT, WATER RELATIONS OF; PLANT PHYSIOLOGY.
- Meyer, Dr. K. F. *Director emeritus, George William Hooper Foundation; Professor emeritus of Experimental Pathology, University of California.* LYMPHOGRANULOMA-PSITTACOSIS GROUP. PLAQUE; TULAREMIA; other articles on bacterial and viral diseases.
- Miczaika, Dr. Gerhard R. *Research Associate, Harvard College Observatory; Manager, Astrometry Department, Aeronutronic Division of Ford Motor Company.* ASTRONOMICAL PHOTOGRAPHY; ASTRONOMICAL SPECTROSCOPY.
- Middlebrook, Dr. Gardner. *Professor of International Medicine, University of Maryland School of Medicine.* JOHNE'S DISEASE; LEPROSY; TUBERCULOSIS.
- Middleton, Prof. John Tylor. *Professor of Plant Pathology, University of California.* CUCUMBER; SQUASH (both in part).
- Miles, Thomas Kirk. *Shell Development Company.* ASPHALT AND ASPHALTITE (in part).
- Mill, Dr. George Stewart. *Research Chemist, Shell Oil Company.* DONNAN EQUILIBRIUM; EMULSION (both in part).
- Miller, Prof. Arthur K. *Former Professor of Geology, State University of Iowa.* CEPHALOPODA FOSSILS (in part).
- Miller, Dr. Glenn Houston. *Atomic Particle Physics Division, Sandia Corporation.* ELECTRICAL CONDUCTION IN GASES; GLOW DISCHARGE; SPARK, ELECTRIC; other articles on electricity.
- Miller, John Harold. *Former Vice-President and Chief Engineer, Weston Instruments, Division of Daystrom, Inc.* AMMETER; CURRENT MEASUREMENT (in part); ELECTRODYNAMIC INSTRUMENT; GALVANOMETER (in part).
- Miller, Dr. Julian Creighton. *Head, Department of Horticulture, Louisiana State University.* POTATO, SWEET (in part).
- Miller, Dr. Lawrence Ingram. *Professor of Plant Pathology, Tidewater Research Station, Virginia Polytechnic Institute.* PEANUT (in part).
- Miller, Prof. Maynard M. *Professor of Geology, Michigan State University; Director, Foundation for Glacier Research, Seattle.* GLACIER; SNOW FIELD; TERRESTRIAL FROZEN WATER; series of related articles.
- Miller, Prof. Milton Albert *Department of Zoology, University of California at Davis.* ANTEURIDEA; ONISCOIDEA.

- Miller, Dr. Stanley L. *Department of Chemistry, University of California, San Diego.* LIFE, ORIGIN OF; PALEOBIOCHEMISTRY.
- Miller, Dr. Winston Rivard. *Medical Director, St. Paul Medical Center.* GLANDERS; MELIOIDOSIS.
- Milligan, Dr. W. O. *The Robert A. Welch Foundation, Houston.* ADSORPTION; ELECTROSTATIC PRECIPITATOR; SURFACE PHENOMENON (all in part); series of related articles.
- Millman, Dr. Jacob. *Department of Electrical Engineering, Columbia University.* INVERTER (in part); OSCILLATOR; PARASITIC OSCILLATION; SIGNAL GENERATOR.
- Mills, Dr. Harlow Burgess. *Illinois Natural History Survey.* AP-TERYGOOTA; COLLEMBOLA; ORTHOPTERA; PROTURA.
- Milner, Dr. Reid T. *Department Head, Food Science, University of Illinois.* CEREAL CHEMISTRY; FOOD ENGINEERING (in part).
- Minnis, Dr. Wesley. *Assistant to Director of Research and Development (retired), Allied Chemical Corporation.* DYE.
- Mischel, Prof. Walter. *Harvard University.* ABNORMAL BEHAVIOR; FREUDIANISM; PERSONALITY THEORY; other articles on neuroses (all co-authored).
- Mitchell, Prof. Harold Hanson. *Professor emeritus of Animal Nutrition, University of Illinois.* IRON METABOLISM; SPECIALIZED TISSUE; other articles on biochemistry.
- Mock, Frank C. *Bendix Products.* CARBURTOR; FUEL SYSTEM; SUPERCHARGER.
- Mulloy, Bruce G. *Assistant to the President, Wallerstein Company, Division of Baxter Laboratories.* TYROTHRICIN.
- Moment, Prof. Gairdner Bostwick. *Coucher College.* CELL CONSTANCY.
- Monmaerts, Prof. Wilfried F. H. M. *Cardiovascular Research Laboratory, University of California, Los Angeles.* MUSCLE (BIOPHYSICS).
- Monod, Prof. Theodore. *Museum National d'Histoire Naturelle, Paris.* GNATHIDEA; PANCARIDA.
- Montgomery, Donald N. *Senior Engineer, Aeronutronic Division of Ford Motor Company.* ELECTROKINETIC TRANSDUCER.
- Mood, Dr. Alexander McFarlane. *Assistant Commissioner, U.S. Office of Education.* STATISTICS.
- Moody, Capt. Alton B. *U.S. Navy Hydrographic Office.* CELESTIAL NAVIGATION; DEAD RECKONING; NAVIGATION; other articles on navigation.
- Moody, Prof. Paul Amor. *Howard Professor of Natural History and Zoology, University of Vermont.* EVOLUTION, ORGANIC.
- Moog, Dr. Florence. *Professor of Zoology, Washington University, St. Louis.* DIGESTIVE SYSTEM (in part).
- Moore, Dr. Alice Elizabeth. *Associate Member, Sloan-Kettering Institute for Cancer Research.* POLYOMA VIRUS; TUMOR VIRUSES; other articles on individual tumor viruses.
- Moore, David William. *President, Moore-Peterson Associates, Santa Barbara, California.* MICROCIRCUITRY.
- Moore, Dr. Donald V. *Department of Microbiology, Southwestern Medical School, University of Texas.* ACANTHOCEPHALA; ARCHIACANTHOCEPHALA; EOCANTHOCEPHALA; PALAEACANTHOCEPHALA.
- Moore, Prof. John A. *Professor of Zoology, Barnard College and Columbia University.* SPECIATION.
- Moore, Prof. John C. *Associate Professor of Mathematics, Princeton University.* TETRAPOLY.
- Moore, Dr. M. B. *Department of Plant Pathology, Institute of Agriculture, University of Minnesota.* OATS (in part).
- Moore, Prof. Raymond C. *Department of Geology, University of Kansas.* CARBONIFEROUS; ECHINODERMATA FOSSILS; other articles on geologic divisions.
- Moore, Prof. Richard K. *Center for Research in Engineering Science, University of Kansas.* ALTIMETER, RADIO.
- Moreno, Dr. Theodore. *Vice-President, Tube Division, Varian Associates.* MICROWAVE TRANSMISSION LINES.

- Morey, Dr. George W. U.S. Geological Survey. OPTICAL MATERIALS.*
- Morgan, Dr. Ann Haven. Mount Holyoke College. EPHEMEROPTERA; PICOPTERA.*
- Morgan, Armand Malcolm. Rear Admiral (retired), U.S. Navy. SHIP, NAVAL.*
- Morgan, Dr. Clifford T. Former Lecturer in Psychology, University of California, Santa Barbara. PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.*
- Morgan, Dr. Karl Ziegler. Director of Health Physics, Division of Oak Ridge National Laboratory. DECONTAMINATION (RADIOACTIVE CONTAMINANTS); RADIOACTIVE WASTE DISPOSAL; other articles on health physics.*
- Morgan, William E. President, Colorado State University. AGRICULTURE (in part).*
- Morris, Robert M. Radio Facilities Engineer, American Broadcasting Company. TELEVISION TRANSMITTER.*
- Morrison, Dr. Charles Freeman, Jr. Assistant Professor of Chemistry, Washington State University. COULOMETRIC ANALYSIS; ELECTRODEPOSITION ANALYSIS*
- Morrison, Dr. George H. Head, Inorganic and Analytical Chemistry, General Telephone and Electronics Laboratories, Inc. EXTRACTION (in part); SEPARATION (CHEMICAL AND PHYSICAL).*
- Morse, Prof. Robert W. Physics Department, Brown University. SONAR, UNDERWATER SOUND; related articles on acoustics*
- Morse, Dr. Roy Earl. Director of Research, Thomas J. Lipton, Inc. CITRUS FLAVORING; SPICE AND FLAVORING, VANILLA EXTRACT; other articles on food science.*
- Morton, G. A. RCA Laboratories. LIGHT AMPLIFIER*
- Moser, J. F., Jr. Esso Research Laboratories, Humble Oil Refining Company. COKING (PETROLEUM REFINING).*
- Moses, Dr. Montröse J. Associate Professor of Anatomy, Duke University School of Medicine. CELL NUCLEUS, CELL STRUCTURES.*
- Mossman, Prof. Harland Winifield. Professor of Anatomy, Medical School, University of Wisconsin. PLACENTATION.*
- Mottel, Dr. N. Karle. Associate Professor of Pathology, Director of Pathology, University of Washington Hospital. ONCOLOGY (in part).*
- Mowrer, Dr. O. Hobart. Research Professor of Psychology, University of Illinois. AGGRESSION; FRUSTRATION.*
- Moxon, Dr. Alvin L. Professor and Associate Chairman, Animal Science Department, Ohio Agricultural Experiment Station. AGRICULTURAL SCIENCE (ANIMAL).*
- Mrak, Chancellor Emil Marcel. University of California at Davis. DISTILLED SPIRITS, YEAST; articles on industrial uses of yeast (all co-authored).*
- Mudd, Prof. Stuart. Professor emeritus of Microbiology, University of Pennsylvania School of Medicine; Director, Microbiology Research Program, Veterans Administration Hospital, Philadelphia. LYOPHILIZATION.*
- Mueller, Prof. Erwin W. Department of Physics, Pennsylvania State University. FIELD-EMISSION MICROSCOPY.*
- Mühlthaler, Prof. Dr. Kurt. Swiss Federal Institute of Technology, Zurich. CELL PLASTIDS.*
- Mulliken, Prof. Robert Sanderson. Physics Department, University of Chicago. MOLECULAR STRUCTURE AND SPECTRA; MOLECULE.*
- Munnecke, Dr. Donald E. Associate Professor of Plant Pathology, University of California. ORNAMENTAL PLANT (in part).*
- Murphy, Dr. Glenn. Distinguished Professor of Engineering and Head of Nuclear Engineering, Iowa State University. FROUDE NUMBER; MACH NUMBER; MODEL THEORY; REYNOLDS NUMBER.*
- Murphy, Harold P. Research Chemical Engineer (retired), Electric Storage Battery Company. STORAGE BATTERY.*



- Murray, Dr. Grover E. *Boyd Professor of Geology and Vice-President for Academic Affairs, Louisiana State University.* CENOZOIC; articles on related divisions of geologic time (co-authored).
- Murray, Dr. Haydn H. *Vice-President, Georgia Kaolin Company.* CLAY, COMMERCIAL.
- Musacchia, Dr. X. J. *Department of Physiology and Space Sciences Research Center, University of Missouri.* HIBERNATION (in part).
- Muskat, Dr. Morris. *Technical Coordinator, Production Department, Gulf Oil Corporation.* PETROLEUM RESERVOIR ENGINEERING.
- Muther, Richard. *Executive Director, Richard Muther and Associates.* MATERIALS HANDLING; PLANT FACILITIES; PRODUCTION METHODS.
- Muus, Dr. Bent J. *Research Biologist, Danish Institute for Fishery and Marine Research.* GORDIOIDEA; NECTONEMATOIDEA; NEMATOMORPHA.
- Myer, Percy Livingstone. *Project Engineer, Western Union Telegraph Company.* TELEGRAPHY (in part).
- Myrvik, Dr. Quentin N. *Department of Microbiology, Bowman Gray School of Medicine of Wake Forest College.* BACTERIAL GROWTH; BACTERIAL ENZYME (both in part).
- Nachtrieb, Prof. Norman Harry. *Institute for the Study of Metals, and Chairman, Department of Chemistry, University of Chicago.* LIQUID; VAPOR PRESSURE; VISCOSITY OF LIQUIDS; other articles on physical chemistry.
- Nafe, Dr. John E. *Professor of Geophysics, Columbia University.* MARINE SEDIMENTS (in part).
- Nair, Dr. John H. *Consultant.* FOOD MANUFACTURING (in part).
- Naistat, Dr. Samuel S. *Manager, Active Oxygen Chemicals Research, Food Machinery and Chemical Corporation.* PEROXIDE.
- Namias, Jerome. *Associate Director, National Meteorological Center for Extended Forecast Division, Weather Bureau, Environmental Science Services Administration.* WEATHER (FORECASTING AND INTERPRETATION) - in part.
- Napp-Zinn, Prof. Dr. Klaus. *Service de B.M.P.V., Domaine Universitaire, St. Martin-d'Hères (Isère), France.* VERNALIZATION.
- Naylor, Dr. Ernest. *Senior Lecturer in Zoology, University College of Swansea, Wales.* VALVIFERA.
- Nedelsky, Prof. Leo. *Professor of Physical Sciences, University of Chicago.* BALANCE (WEIGHING INSTRUMENT); MASS, WEIGHT; series of related articles.
- Neilands, Dr. J. B. *Department of Chemistry, University of California.* ION TRANSPORT COMPOUNDS; MICROBIAL.
- Nelsen, Prof. Olin E. *Professor of Zoology, Division of Biology, University of Pennsylvania.* GLAND; articles on various glands.
- Nelson, Elton Glen. *Department of Commerce, Office of Textiles, Assistant Director, Business Services and Analysis Division.* FIBER CROPS; FLAX (in part); HEMP.
- Nelson, Prof. Eric L. *Vice-President, Research, Allergan Pharmaceuticals.* BRUCELLACEAE.
- Nelson, James Hugh. *Chief, Geomagnetism Division, U.S. Coast and Geodetic Survey.* DECLINOMETER; EARTH INDUCTOR; INCLINOMETER; MAGNETOMETER; VARIOMETER.
- Nelson, Prof. Leyton Vincent. *Professor of Crop Science, Crop Science Extension Project Leader, Michigan State University.* BEAN (in part).
- Nelson, Norman E. *Vice-President and Chief Engineer, Doak Aircraft Company, Inc.* VERTICAL TAKE-OFF AND LANDING (VTOL).
- Nelson, Prof. Raymond John. *Professor of Mathematics and Philosophy, Case Institute of Technology.* CALCULATING MACHINES; DATA PROCESSING SYSTEMS; DIGITAL COMPUTER; series of related articles.

- Nesbitt, Dr. Herbert H. J. *Dean, Faculty of Science, Carleton University, Canada.* SARCOPTIFORMES.
- Nettleton, Dr. Lewis L. *Partner, Geophysical Associates, International.* SALT DOME.
- Neuhauser, Robert G. *Engineering Leader, Camera Tube Design, Electron Tube Division, Radio Corporation of America.* TELEVISION CAMERA TUBE.
- Neumann, Dr. P. Gerhard. *Professor of Oceanography, New York University.* OCEAN WAVES (in part).
- Newcombe, Dr. Curtis Lakeman. *Director, Frederic Burk Foundation Research Center, and Professor of Biology, San Francisco State College.* MARINE ECOSYSTEM.
- Newton, Dr. Chester Whittier. *Program Scientist, National Center for Atmospheric Research.* HURRICANE; STORM; TORNADO; other articles on storms and winds.
- Nichols, Dr. Mark Lovel. *Collaborator, National Tillage Machinery Laboratory, Agricultural Research Service, Agricultural Engineering, U.S. Department of Agriculture.* AGRICULTURAL SOIL AND CROP PRACTICES (in part); TERRACING (AGRICULTURAL).
- Nicol, Dr. Joseph A. Colin. *Experimental Zoologist, Marine Biological Association, Plymouth, England.* NERVOUS SYSTEM (IN-VERTEBRATE).
- Niedermair, John C. *Technical Director of Preliminary Ship Design (retired), Bureau of Ships, U.S. Department of the Navy; Consultant Naval Architect.* NAVAL ARCHITECTURE; SHIP DESIGN.
- Nier, Prof. Alfred O. *University of Minnesota.* MASS SPECTROSCOPE.
- Nierenberg, Prof. William A. *Director, Scripps Institution of Oceanography, University of California, San Diego.* NUCLEAR MOMENTS.
- Nigrelli, Dr. Ross F. *Osborn Laboratories of Marine Sciences, New York Aquarium.* MYXOSPORIDIA; articles on related taxonomic groups.
- Niven, Dr. Charles F., Jr. *Director, Scientific Research Department, California Packing Corporation.* MICROBIOLOGICAL METHODS; PASTEURIZATION; STERILIZATION.
- Nixon, Dr. Alan C. *Research Supervisor, Shell Development Company.* GASOLINE.
- Noback, Charles Robert. *Department of Anatomy, College of Physicians and Surgeons, Columbia University.* MUSCULAR SYSTEM (in part).
- Noble, Dr. James A. *Geological Sciences, California Institute of Technology.* BATHOLITH; LACCOLITH; PLUTON.
- Nordell, Eskel. *Director of Technical Information, The Permutit Company.* WATER SOFTENING.
- Nottingham, Professor W. B. *Professor emeritus of Physics, Massachusetts Institute of Technology.* THERMIONIC POWER GENERATOR.
- Novick, Aaron. *Institute of Molecular Biology, University of Oregon.* CHEMOSTAT.
- Novikoff, Dr. Alex B. *Research Professor of Pathology, Albert Einstein College of Medicine, Yeshiva University.* CYTOCHEMISTRY.
- Obery, Leonard J. *Assistant Chief, Office of Development Plans and Programs, National Aeronautics and Space Administration.* DIFFUSER; SUPERSONIC DIFFUSER (both in part).
- O'Connor, Dr. Donald J. *Professor of Civil Engineering, Manhattan College.* SEWAGE DISPOSAL; WATER POLLUTION.
- O'Connor, Francis Martin. *Group Leader, Molecular Sieve Products, Linde Company, Division of Union Carbide Corporation.* MOLECULAR SIEVE (in part).
- Odum, Dr. Eugene Pleasants. *Alumni Foundation Professor of Zoology, University of Georgia.* ECOLOGY.
- Ofner, Dr. Alfred. *Director of Technical Development, Hoffmann-LaRoche, Inc.* VITAMIN E; VITAMIN K (both in part).

- Ogle, Dr. Kenneth N. *Section of Biophysics, Mayo Clinic.* STEREOGRAPHY.
- Ohman, M. F. *Manager of Operations, Western Division, Dow Chemical Company.* IODINE (in part).
- Okulitch, Dr. Vladimir J. *Professor and Head, Department of Geology, University of British Columbia, Canada.* ARCHAEOCYATHA; PORIFERA FOSSILS.
- Old, Dr. Bruce Scott. *Senior Vice-President, Arthur D. Little, Inc.* FURNACE (PRESSURIZED BLAST).
- Oldenburger, Prof. Rufus. *School of Mechanical Engineering, Purdue University.* GOVERNOR; LINKAGE, MECHANICAL.
- Olson, Prof. Everett Claire. *Department of Geology, University of Chicago.* ANAPSIDA; SYNAPSIDA; articles on related fossil groups.
- Olson, Dr. Harry F. *Director, Acoustical and Electromechanical Laboratory, Radio Corporation of America Laboratories.* DISK RECORDING; MAGNETIC RECORDING; MICROPHONE; series of related articles.
- Olszewski, Robert Francis. *Research Consultant, Dodco, Inc.* AIRCRAFT INSTRUMENT PANEL (in part).
- Opik, Dr. Ernest Julius. *Professor of Astrophysics, University of Maryland; on leave from Armagh Observatory, North Ireland.* INTERSTELLAR SPACE.
- Oppenheimer, Prof. Jane M. *Professor of Biology, Bryn Mawr College.* EMBRYOLOGY.
- Osberg, Prof. Philip Henry. *University of Maine.* FAULT AND FAULT STRUCTURES FOLD AND FOLD SYSTEMS; other articles on structural geology.
- Oser, Dr. Bernard L. *Food and Drug Research Laboratories, Inc.* FOOD (in part).
- Osternan, John A. *Government Communications Coordinator, American Telephone and Telegraph Company.* TELEPHONE CIVIL DEFENSE SYSTEM.
- Othmer, Prof. Donald F. *Polytechnic Institute of Brooklyn.* FLUIDIZATION OF SOLIDS.
- Otis, Dr. A. B. *Department of Physiology, College of Medicine, University of Florida.* RESPIRATION, EXTERNAL; SPIROMETRY.
- Owen, Dr. Bradford Breckenridge. *Associate Professor of Biology, Lehigh University.* KIDNEY.
- Pabst, Dr. Adolf. *Professor of Mineralogy, Department of Geology and Geophysics, University of California at Berkeley.* METAMICT STATE; PLEOCHROIC HALOS.
- Packard, Dr. Charles E. *Assistant Professor of Biology, Randolph-Macon College, Ashland, Virginia.* CHAETONOIDEA; GASTROTRICHA; MACRODASYOIDEA.
- Page, Dr. Robert M. *Professor, Department of Biological Sciences, Stanford University.* ASCOMYCETES; BASIDIOMYCETES; series of articles on related groups of fungi.
- Pai, Prof. Shih I. *Research Professor, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.* LAMINAR FLOW; TURBULENT FLOW; VISCOUS FLOW.
- Pake, Prof. George E. *Physics Department, Washington University.* DYNF; FORCE; NEWTON; POUNDAL.
- Palmerlee, Prof. Albert S. *Professor of Engineering Drawing, School of Engineering and Architecture, University of Kansas.* DESCRIPTIVE GEOMETRY; ENGINEERING DRAWING; ENGINEERING GRAPHICS; PICTORIAL DRAWING (all in part).
- Panofsky, Prof. Wolfgang K. H. *Professor of Physics; Director, Stanford Linear Accelerator Center, Stanford University.* PARTICLE ACCELERATOR; articles on various particle accelerators.
- Parker, Eugene N. *Professor, Fermi Institute and Department of Physics, University of Chicago.* COSMIC RAYS.
- Parkes, Dr. Kenneth Carroll. *Curator of Birds, Carnegie Museum.* AVES; articles on related taxonomic groups.
- Parks, Prof. George Sutton. *Department of Chemistry, Stanford University.* CALORIMETRY; THERMOCHEMISTRY.

- Parks, Prof. Roland D. *Geology and Geophysics Department, Massachusetts Institute of Technology.* MINING OPERATING FACILITIES (in part).
- Part, Prof. Robert G. *Department of Chemistry, Johns Hopkins University.* CHEMICAL BOND THEORY.
- Parrish, Dr. William. *Chief, X-ray and Crystallography Sections, Philips Laboratories.* X-RAY FLUORESCENCE ANALYSIS; X-RAY POWDER METHODS.
- Parry, Prof. Robert Walter. *Department of Chemistry, University of Michigan.* CHELATION.
- Patten, Dr. Bradley M. *Professor emeritus of Anatomy, University of Michigan Medical School.* CARDIOVASCULAR SYSTEM (in part).
- Patterson, Dr. Claire Cameron. *Division of Geological Sciences, California Institute of Technology.* EARTH (AGE OF).
- Patton, Dr. Harry Dickson. *Professor of Physiology and Biophysics, University of Washington School of Medicine.* MOTOR SYSTEMS; POSTURE, REGULATION OF; REFLEX, UNCONDITIONED (all in part).
- Pattullo, Dr. June G. *Department of Oceanography, Oregon State University.* SEA LEVEL (DATUM PLANES); SEA LEVEL FLUCTUATIONS; SEA WATER (in part).
- Pauliny-Toth, Dr. Ivan I. K. *National Radio Astronomy Observatory.* RADIO SOURCES (ASTRONOMY).
- Payne, Harold G. *Manager, Measurements Group, The Foxboro Company.* PRESSURE MEASUREMENT; VACUUM MEASUREMENT (both in part); other articles on pressure and vacuum instrumentation.
- Peck, Prof. Raymond E. *Department of Geology, University of Missouri.* CHAROPHYTA.
- Pederson, Dr. Carl S. *New York State Agricultural Station.* LACTOBAGILLACEAE.
- Peirce, Willis McGerald. *Assistant to the President (retired), New Jersey Zinc Company.* CADMIUM METALLURGY; ZINC ALLOYS; ZINC METALLURGY.
- Pennak, Dr. Robert W. *Department of Biology, University of Colorado.* MYSTACOCARIDA.
- Perch, Michael. *Verona Research Center, Koppers Company, Inc.* COKE.
- Perkins, Dr. David D. *Department of Biological Sciences, Stanford University.* LINKAGE, GENETIC; RECOMBINATION, GENETIC; SEX-LINKED INHERITANCE.
- Perkins, Kenneth W. *Science Writer and Editor.* METAL; PRECESSION OF EQUINOXES; ROCKET ASTRONOMY; articles on physics and acoustical engineering.
- Perry, Astor. *Extension Agronomist, North Carolina State University.* PEANUT (in part).
- Pette, Prof. Dr. Jan Willem. *Director-in-Chief, The Netherlands Institute for Dairy Research at Ede; Professor in Milk Hygiene, University of Utrecht.* BUTTER; CHEESE; ICE CREAM; MILK (all in part).
- Pettit, Dr. Edison. *Former Member (retired), Scientific Staff, Mount Wilson and Mount Palomar Observatories.* OBSERVATORY, ASTRONOMICAL.
- Pfaffmann, Dr. Carl. *Rockefeller University.* SENSE, CHEMICAL; SMELL; TASTE.
- Pfeiffer, Carl G. *Supervisor, Space Guidance Theory Group, Jet Propulsion Laboratory.* SPACE NAVIGATION AND GUIDANCE.
- Phaff, Dr. Herman Jan. *Professor of Food Science and Technology, University of California at Davis.* DISTILLED SPIRITS; FOOD MICROBIOLOGY; YEAST (all in part); series of articles on fungi.

- Phelan, Richard M. *Professor of Mechanical Engineering, Cornell University.* FRICTION; SCREW; SIMPLE MACHINE; other articles on machine design.
- Philip, Dr. Cornelius B. *Principal Entomologist, Rocky Mountain Laboratory, U.S. Public Health Service.* RICKETTSIALES; RICKETTSIOSES; TICK PARALYSIS; articles on rickettsial infections.
- Philpott, Dr. Jane. *Associate Professor of Botany, Duke University.* LEAF (BOTANY)—in part.
- Pierce, Prof. E. Lowe. *Department of Zoology, University of Florida.* CHAETOGNATHA.
- Pierson, Prof. Willard James. *Department of Meteorology and Oceanography, School of Engineering and Science, New York University.* OCEAN WAVES (in part).
- Pilgrim, Lieut. Hal Wilson. *U.S. Navy.* UNDERWATER DEMOLITION.
- Pinkel, Benjamin. *Associate Head, Aero-Astronautics Department, Rand Corporation.* AIRCRAFT PROPULSION; TURBOJET; TURBORAMJET; series of related articles.
- Pipkin, Dr. Sarah Bedichek. *Department of Biology, Johns Hopkins University.* SEX DETERMINATION.
- Platt, Prof. Clarence Sellers. *Chairman of Department of Poultry Science (retired), Rutgers University.* POULTRY PRODUCTION.
- Platt, Dr. Robert Baxter. *Professor of Biology, Emory University.* ENVIRONMENT.
- Plummer, Harry Custer. *Dean, Engineering and Technology, Structural Clay Products Institute.* MASONRY.
- Pogorzelski, H. A. 'Mathematical Reviews,' *American Mathematical Society.* MATHEMATICAL NOTATION, CONTEMPORARY (in part).
- Pohm, Prof. Arthur V. *Electrical Engineering Department, Iowa State University.* MAGNETIC THIN FILMS.
- Pollard, Dr. Ernest C. *Chairman, Department of Biophysics, Yale University.* RADIATION BIOLOGY.
- Pollard, Dr. William Grosvenor. *Executive Director of Oak Ridge Institute of Nuclear Studies.* PHYSICS.
- Pollister, Prof. Arthur W. *Columbia University.* CELL (BIOLOGICAL)—in part, CENKIOLE; CENTROSOME; PROTOPLASM (in part).
- Polster, Dr. Harry D. *The Perkin-Elmer Corporation.* MIRROR OPTICS; REFLECTION (ELECTROMAGNETIC RADIATION).
- Ponikvar, Ade L. 'Modern Plastics,' *McGraw-Hill Publishing Company.* OIL MINING; articles on various drills.
- Poole, Lynn. *Assistant to Vice President, Johns Hopkins University.* ART, SCIENCE IN.
- Popp, Prof. Frank D. *Associate Professor, Department of Chemistry, Clarkson College of Technology.* FERROGENE.
- Potter, Prof. M. David. *Professor, San Francisco State College.* LANDSCAPE ARCHITECTURE.
- Porter, Prof. Keith Roberts. *Harvard University.* CELL INCLUSIONS, NONCYTOPLASMIC; CYTOLOGY; CYTOPLASM.
- Post, Dr. Richard F. *Lawrence Radiation Laboratory, University of California, Livermore.* FUSION, NUCLEAR; PLASMA PHYSICS; PROTON-PROTON CHAIN; THERMONUCLEAR REACTION.
- Potter, Prof. M. David. *Professor, San Francisco State College.* TEXTILE; articles on various animal and plant fibers.
- Poulson, Prof. Donald F. *Professor of Biology, Department of Biology, Yale University.* LETHAL GENE.
- Powell, Dr. Wilson Frederick. *Department of Pathology, Yale University School of Medicine.* ATROPHY; DEATH; HYPERTROPHY; series of related articles.

Prescott, Dr. G. W. *Professor of Botany, Michigan State University.* CHAROPHYCEAE; CHLOROPHYCEAE; CHLOROPHYTA; other related articles on algae.

Presley, Dr. John T. *Investigations Leader, Cotton and Cordage Fibers Research Branch, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture.* COTTON (in part).

Press, Dr. Frank. *Department of Geology and Geophysics, Massachusetts Institute of Technology.* SEISMOGRAPH; SEISMOLOGY.

Prien, Dr. Charles H. *Head, Chemistry and Chemical Engineering Division, Denver Research Institute, University of Denver.* PYROLYSIS.

Priester, Gayle B. *Baltimore Gas and Electric Company.* HEATING, COMFORT.

Pringsheim, Prof. E. G. *Pflanzenphysiologisches Institut, Göttingen, Germany.* BEGGIATOALES; CARYOPHANALES; CHLAMYDOBACTERIALES.

Pritchard, Prof. Donald William. *Chairman, Department of Oceanography, Johns Hopkins University.* ESTUARINE OCEANOGRAPHY (in part).

Pritchett, W. S. *Senior Project Engineer, Noller Control Systems, Inc., Richmond, California.* CAPACITOR; INDUCTOR, REACTOR, ELECTRIC; SATURABLE REACTOR; WAVEFORM, NONSINUSOIDAL (all in part).

Proctor, Prof. Bernard Emerson. *Former Professor and Head, Department of Food Technology, Massachusetts Institute of Technology.* FOOD (in part).

Prophet, Prof. Edward C. (Formerly) *Department of Geography, Michigan State University.* NORTH AMERICA (in part).

Prosser, Prof. C. Ladd. *Physiology Department, University of Illinois.* HEMEOSTASIS.

Protter, Prof. Murray H. *Professor of Mathematics, University of California.* POTENTIALS (MATHEMATICS).

Pryke, John K. M. *Principal, Slocum and Fuller, New York.* CENTRAL HEATING.

Puchstein, Albert Frederick. *Consulting Engineer (retired).* ALTERNATING-CURRENT MOTOR (in part); MOTOR, ELECTRIC, series of related articles.

Puck, Dr. Theodore T. *Department of Biophysics, University of Colorado.* CULTURE, TISSUE.

Pullen, Dr. Keats A. *Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland.* CIRCUIT, ELECTRONIC; TRANSFORMER (both in part).

Putnam, Prof. Russell Caldwell. *Professor emeritus, Case Institute of Technology.* PHOTOMETER; PHOTOMETRY; other articles on photometric units.

Putz, T. J. *Industrial Gas Turbine Department, Westinghouse Electric Corporation.* GAS TURBINE.

Pyddoke, Edward. *Secretary and Registrar, University of London Institute of Archaeology, England.* ARCHEOLOGY.

**Q** Quastler, Dr. Henry. *Senior Radiobiologist, Brookhaven National Laboratory.* INFORMATION THEORY (BIOLOGICAL APPLICATIONS).

Quirin, Edward J. *Frederic R. Harris, Inc., Consulting Engineers.* COASTAL ENGINEERING; COFFERDAM; other articles on coastal engineering.

**R** Raasch, Dr. Gilbert O. *Consulting Paleontologist, Shell Oil of Canada.* EURYPTERIDA; MEROSTOMATA.

Rabinowitch, Dr. Eugene. *Professor of Botany and Biophysics, Department of Botany and Department of Physiology and Biophysics, University of Illinois.* PHOTOSYNTHESIS (in part).

Rademacher, Prof. Hans. *Professor emeritus of Mathematics, University of Pennsylvania; Visiting Professor, Rockefeller Institute.* NUMBER THEORY; ZERO.

- Raffel, Dr. Sidney. *Stanford University School of Medicine*. ALLERGY, ATOPIC; ANAPHYLAXIS; ARTHUS REACTION; HYPERSENSITIVITY.
- Ragazzini, Dr. John R. *Dean, School of Engineering and Science, New York University*. COMPUTER CONTROL SYSTEM; PROCESS CONTROL; SAMPLED-DATA CONTROL SYSTEM; other articles on control systems.
- Ragotzkie, Prof. Robert A. *Department of Meteorology, University of Wisconsin*. MARINE MARSH.
- Raisz, Dr. Erwin. *U.S. Geological Survey, National Atlas Project*. CARTOGRAPHY; GREAT CIRCLE, TERRESTRIAL; MAP SCALE.
- Rakestraw, Dr. Norris W. *Scripps Institution of Oceanography, University of California*. SEA WATER (in part).
- Ramberg, Dr. Edward G. *Fellow, Technical Staff, Radio Corporation of America Laboratories*. ELECTRON MOTION IN VACUUM; ELECTROSTATIC LENS; MICROSCOPE, ELECTRON (in part); other articles on electron optics.
- Ramberg, Prof. Hans. *Professor in Mineralogy, Mineralogisch-Geologisches Institut, Uppsala Universitet, Sweden*. DUNITE.
- Ramey, Dr. Robert Lee. *Professor of Electrical Engineering, University of Virginia*. DIRECT-CURRENT THEORY, ELECTRICAL MEASUREMENTS (in part); GROUNDING, ELECTRONIC EQUIPMENT; RESISTOR; series of related articles.
- Ramsdell, Prof. Lewis Stephen. *Professor emeritus, University of Michigan*. MINERAL; MINERALOGY.
- Ramsey, Dr. Glen Blaine. *Principal Pathologist, Agricultural Marketing Service, U.S. Department of Agriculture*. LETTUCE; ONION (both in part).
- Raper, Prof. John R. *Professor of Botany, Harvard University*. FUNGICIDES.
- Raper, Prof. Kenneth B. *Departments of Bacteriology and Botany, University of Wisconsin*. ACASIALES; LABYRINTHULALES.
- Rashevsky, Prof. Nicolas. *Mental Health Research Institute, University of Michigan*. BIOPHYSICS, MATHEMATICAL.
- Raski, Dr. Dewey J. *Nematologist, Department of Nematology, University of California at Davis*. NEMATOCIDE.
- Ratcliff, Dr. Floyd. *The Rockefeller Institute*. BEHAVIORAL PSYCHOPHYSICS.
- Ratnoff, Dr. Oscar D. *Professor of Medicine, Western Reserve University; Career Investigator, American Heart Association*. BLOOD (in part); FIBRINOGEN.
- Raudebaugh, Dr. Robert J. *Technical Assistant to Manager, Paul D. Merica Research Laboratory, International Nickel Company, Inc.* NICKEL ALLOYS.
- Rausch, Dr. Marvin D. *Department of Chemistry, University of Massachusetts*. GRIGNARD REACTION; ORGANOMETALLIC COMPOUND; REFORMATSKY REACTION; TETRAETHYLEAD.
- Rawles, Dr. Mary Elbert. *Staff Member, Department of Embryology, Carnegie Institution of Washington, Baltimore*. FEATHER (BIRD); UROPOGIAL GLAND.
- Razran, Prof. Gregory. *Professor and Chairman, Department of Psychology, Queens College*. REFLEX, CONDITIONED.
- Read, Prof. Clark P. *Department of Biology, Rice University*. CESTODA; articles on related taxonomic groups.
- Reddi, Dr. K. K. *Rockefeller Institute*. DEOXYRIBONUCLEIC ACID.
- Reddish, Dr. George Fultz. (Formerly) *St. Louis College of Pharmacy and Allied Sciences*. ANTISEPTIC.
- Redlich, Dr. Frederick Carl. *Professor and Chairman, Department of Psychiatry, Yale University School of Medicine*. PSYCHOANALYSIS; PSYCHOTHERAPY; articles on various psychoses.

- Reed, Prof. Fredda D. *Professor emeritus of Botany, Mount Holyoke College.* CALAMITALES.
- Reed, Prof. Richard John. *University of Washington.* FRONT.
- Reed, Dr. Roger W. *Professor and Chairman, Department of Bacteriology and Immunology, McGill University, Canada.* LISTERIOSIS.
- Rees, Dr. Bryant F. *Professor of Biology, Fresno State College.* ENIOPTERYGOTA; MECOPTERA.
- Reeve, Dr. Roger M. *Histologist, Western Utilization Research and Development Division, U.S. Department of Agriculture.* SEED (BOTANY).
- Reid, Dr. Evans Burton. *Merrill Professor of Chemistry, Chairman of Department of Chemistry, Colby College.* CARBOXYLIC ACID; ESTER; articles on various derivatives of carboxylic acid.
- Reid, Joseph Lee, Jr. *Associate Research Oceanographer, Scripps Institution of Oceanography, University of California.* PACIFIC OCEAN; SEA WATER (in part).
- Reid, Prof. Robert O. *Department of Oceanography and Meteorology, Agricultural and Mechanical College of Texas.* STORM SURGE.
- Reifsnyder, Dr. William Edward. *Professor of Forest Meteorology, Yale School of Forestry.* FOREST FIRE CONTROL.
- Reinnuth, Prof. William H. *Assistant Professor of Chemistry, Columbia University.* ANALYTICAL CHEMISTRY; DIELECTRIC CONSTANT; POLAROGRAPHIC ANALYSIS.
- Reischman, O.S.B., Rev. Placidus George. *Head of Department of Biology, St. Martin's College.* PARASITIC CASTRATION; RHIZOCEPHALA.
- Renfrow, Dr. William B., Jr. *Department of Chemistry, Oberlin College.* CONDENSATION REACTION.
- Reno, Horace T. *U.S. Bureau of Mines.* MINING OPERATING FACILITIES (in part).
- Renzoni, Louis Secondo. *Manager, Process Research, International Nickel Company of Canada, Ltd.* NICKEL METALLURGY.
- Reyniers, Prof. James Arthur. *Director, Germfree Life Research Center, Tampa, Florida.* GERMFREE VERTEBRATE.
- Rich, Prof. Alexander. *Professor of Biophysics, Massachusetts Institute of Technology.* MOLECULAR BIOPHYSICS.
- Rich, Dr. Saul. *Plant Pathologist, Connecticut Agricultural Experiment Station.* FUNGISTAT AND FUNGICIDE (in part).
- Richards, Dr. Geoffrey Norman. *British Rayon Research Association, Manchester, England.* CELLULOSE; GLUCOSIDE; GLYCOSIDE (all in part).
- Richards, Dr. Oscar W. *Chief Biologist, American Optical Company Research Center.* MICROSCOPE; MICROSCOPE, FLUORESCENCE (in part); MICROSCOPE, OPTICAL (in part); MICROSCOPE, REFLECTING.
- Richey, Clarence Bentley. *Chief Engineer, Fowler Division, Massey-Ferguson Inc., Fowler, California.* AGRICULTURAL ENGINEERING; AGRICULTURAL MACHINERY; DAIRY MACHINERY.
- Richmond, John Paul. *Vice-President (retired), Finance, ACF Industries, Inc.* INDUSTRIAL CONTROL.
- Riddell, Prof. John Evans. *Professor of Geology, Carleton University, Canada.* GEOCHEMICAL PROSPECTING.
- Riehl, Dr. Herbert. *University of Chicago.* TROPICAL METEOROLOGY.
- Ries, Dr. Harold C. *Stanford Research Institute.* ALKYLATION; ALKYLATION, PETROLEUM; KEROSENE.
- Riggs, Dr. Austen Fox. *Department of Zoology, University of Texas.* RESPIRATORY PIGMENTS.



- Riggs, Harold C. *Manager, Marketing New Product Development, Electric Storage Battery Company*. BATTERY (ELECTRIC).
- Riggs, Prof. Lorin Andrews. *Department of Psychology, Brown University*. COLOR; COLOR VISION; VISION; articles on various colors.
- Riley, Prof. Reed F. *Quantum Electronics Group, General Telephone and Electronic*. ALKALINE-EARTH METALS; BARIUM; CALCIUM; STRONTIUM.
- Ris, Prof. Hans. *Department of Zoology, University of Wisconsin*. CHROMOSOME; CHROMOSOME ABERRATION.
- Ritchey, Dr. H. W. *President, Thiokol Chemical Corporation*. PROPELLANT (in part).
- Rittenberg, Dr. Sydney C. *Professor and Chairman, Department of Bacteriology, University of California, Los Angeles*. SPIROCHAETALES; articles on related taxonomic groups; WATER ANALYSIS; other articles on water microbiology.
- Roberts, J. K. *Scientific Design Company*. NAPHTHA. PETROLATUM.
- Robertson, Prof. Burtis Lowell. *Professor of Electrical Engineering, University of California*. ALTERNATING-CURRENT CIRCUIT THEORY; CAPACITOR; WAVEFORM, NONSINUSOIDAL (all in part), other articles on electric circuits and components.
- Robertson, Dr. James S. *Head, Medical Physics Division, Medical Department, Brookhaven National Laboratory*. RADIOISOTOPE (BIOLOGY).
- Robertson, Lemuel Carson. *Vice-President in Charge of Ship Repairs, Newport News Shipbuilding and Dry Dock Company*. DRYDOCKING.
- Robillard, Dr. Jean Jules. *Vice-President, Director of Research, General Transistor Corporation*. PHOTOCONDUCTIVE CELL, PHOTOVOLTAIC CELL.
- Robinson, Prof. Arthur H. *Department of Geography, University of Wisconsin*. COORDINATE SYSTEMS, TERRESTRIAL, MAP PROJECTIONS; other articles on maps; SOIL, ZONAL DISTRIBUTION.
- Rochford, David James. *Principal Research Officer, Division of Fisheries and Oceanography, Commonwealth Scientific and Industrial Research Organization, Australia*. INDIAN OCEAN (in part).
- Rochow, Prof. Eugene George. *Harvard University*. ELECTROCHEMICAL SERIES; ELECTRONEGATIVITY; SILICON.
- Rockett, Frank H. *Engineering Consultant*. Series of articles on astronomy and engineering.
- Roddiss, Louis H., Jr. *President, Pennsylvania Electric Company; Captain, U.S. Naval Reserve*. REACTOR, SHIP PROPULSION.
- Rodebush, Prof. W. H. (Formerly) *Department of Chemistry and Chemical Engineering, University of Illinois*. AEROSOL; HYDROGEN BOND.
- Rodenhiser, Dr. Herman A. *Deputy Administrator, Agricultural Research Service, U.S. Department of Agriculture*. MILLET, SORGHUM (both in part).
- Rodgers, John. *Professor of Geology, Yale University*. DIASTEM; STRATIGRAPHIC NOMENCLATURE; STRATIGRAPHY; UNCONFORMITY.
- Roedder, Dr. Edwin. *Geologist, U.S. Geological Survey*. ORE DEPOSITS, GEOCHEMISTRY OF (in part).
- Roeder, Prof. Kenneth D. *Professor of Physiology, Department of Biology, Tufts University*. INSECT PHYSIOLOGY.
- Rogers, Dr. Terence A. *Department of Physiology and Pharmacology, School of Medicine, University of Hawaii*. DIGESTIVE SYSTEM (in part); METABOLISM IN RUMINANTS.
- Rogick, Dr. Mary Dora. *Former Professor of Biology, College of New Rochelle*. BRYOZOA; articles on related taxonomic groups.

- Rogowski, Prof. Augustus R. *Massachusetts Institute of Technology*. COMBUSTION CHAMBER; IGNITION SYSTEM; LUBRICATION, ENGINE; series of related articles.
- Roller, Dr. Duane E. *Harvey Mudd College*. CONSERVATION OF ENERGY; ENERGY; WORK; series of related articles.
- Romer, Prof. Alfred Sherwood. *Museum of Comparative Zoology, Harvard University*. AMPHIBIA FOSSILS; ANIMAL EVOLUTION; ELASMOBRANCHII FOSSILS; articles on other fossil groups.
- Rosen-Runge, Prof. Edward C. *University of Washington School of Medicine*. ADRENAL GLAND; TESTIS (both in part).
- Root, Dr. William L. *Lincoln Laboratory, Massachusetts Institute of Technology*. NOISE, ELECTRICAL; NOISE GENERATOR, ELECTRICAL.
- Rosenberg, Leon Theodore. *Chief Generator Design Engineer, Thermal Power Department, Allis-Chalmers Manufacturing Company*. ALTERNATING-CURRENT GENERATOR; ELECTRIC ROTATING MACHINERY; GENERATOR, ELECTRIC; series of related articles.
- Rosenberger, Harold E. *Bausch and Lomb Inc.* BINOCULARS; MICROSCOPES; OPERA GLASSES.
- Rosenblatt, Dr. Jay S. *Associate Research Specialist, Institute of Animal Behavior, Rutgers University*. BEHAVIOR, ONTOGENY OF (in part).
- Ross, Dr. Edward Shearman. *Curator, Department of Entomology, California Academy of Sciences*. EMBOPTERA.
- Ross, Dr. Herbert H. *Illinois Natural History Survey*. TRICHOPTERA.
- Ross, Dr. Robert Simon. *Goodyear Aerospace Corporation*. AEROSTAT; AIRSHIP; BALLOON; BLIMP; DIRIGIBLE (all in part).
- Ross, Prof. Sydney. *Professor of Colloid Science, Rensselaer Polytechnic Institute*. COAGULATION; ELECTROPHORESIS; FOAM.
- Rosvold, Dr. H. Enger. *Laboratory of Psychology, National Institute of Mental Health*. ELECTROCONVULSIVE SHOCK; MEMORY.
- Roth, Willard. *Engineer Manager, Sunbeam Equipment Corporation*. RESISTANCE HEATING.
- Rowell, Dr. John Bartlett. *Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture; Department of Plant Pathology and Botany, University of Minnesota*. PLANT DISEASE (in part).
- Roy, Dr. Chalmer J. *Professor of Geology; Dean, College of Sciences and Humanities, Iowa State University*. LOESS, TILL.
- Roy, Prof. Rustum. *Director, Materials Research Laboratory, Pennsylvania State University*. HIGH-PRESSURE PHENOMENA (in part).
- Rubey, Dr. William W. *Department of Geology and Institute of Geophysics, University of California at Los Angeles*. OROGENY.
- Ruch, Dr. Fritz. *Swiss Federal Institute of Technology, Zurich*. DICHROISM (BIOLOGICAL TISSUE).
- Ruch, Prof. Theodore C. *Director, Regional Primate Research Center; Department of Physiology and Biophysics, University of Washington School of Medicine*. EFFECTOR SYSTEMS; MOTOR SYSTEMS; POSTURE, REGULATION OF; REFLEX, UNCONDITIONED (all in part).
- Rudnick, Dr. Dorothea. *Professor of Biology, Albertus Magnus College; Associate in Research, Yale University*. EMBRYOLOGY, EXPERIMENTAL.
- Rudnick, Philip. *Research Physicist, Marine Physical Laboratory of the Scripps Institution of Oceanography, University of California, San Diego*. SEA WATER (in part).
- Ruhe, Dr. Robert V. *Research Geologist, U.S. Department of Agriculture; Soil Conservation Service and Professor of Soils, Iowa State University*. PALEOBOL.

Runcorn, Prof. Stanley Keith. *Physics Department, University of Newcastle upon Tyne, England.* ROCK MAGNETISM.

Rupp, Arthur F. *Oak Ridge National Laboratory; Union Carbide Corporation.* RADIOISOTOPE PRODUCTION.

Rushton, Prof. J. Henry. *Professor of Chemical Engineering, Purdue University.* MIXING.

Rusk, Dr. Rogers D. *Mount Holyoke College.* ACCELERATION (in part); MOTION, RECTILINEAR; VELOCITY (in part); series of related articles.

Rusnak, Dr. Gene Alexander. *Assistant Professor of Marine Geology, The Marine Laboratory, University of Miami.* MARINE SEDIMENTS; OCEANOGRAPHY (both in part).

Russell, Dr. H. W. *Former Technical Director, Battelle Memorial Institute.* BOLOMETER; DEWAR FLASK; INCANDESCENCE; RADIO-METRY; RADIOMICROMETER.

Russell, Prof. Richard J. *Professor of Geography; Director, Coastal Studies Institute, Louisiana State University.* COASTAL LANDFORMS; ESCARPMENT; FLOOD PLAINS; FLUVIAL EROSION CYCLE.

Russell, Prof. Roger Wolcott. *Department of Psychology, Indiana University.* HYPOTHERMIA.

Ryan, Prof. James J. *Professor emeritus, Mechanical Engineering Department, Institute of Technology, University of Minnesota.* BRAKE (in part); CLUTCH (in part); COUPLING; other articles on machine design.

Ryther, Dr. John H. *Woods Hole Oceanographic Institution.* SEA WATER FERTILITY (in part).

Sacks, Dr. Martin. *Biology Department, City College of New York.* KINORHYNCHA.

Sackton, Dr. Waldemar E. *Professor and Chairman, Department of Plant Pathology, Macdonald College of McGill University, Canada.* SUNFLOWER (in part).

Salton, Prof. Milton R. J. *Department of Microbiology, New York University School of Medicine.* BACTERIAL CELL CHEMISTRY.

Salutsky, Dr. Murrell Leon. *Director of Research, Dearborn Chemical Division W. R. Grace and Company.* RADIUM.

Sandage, Dr. Allan R. *Astronomer, Mount Wilson and Palomar Observatories.* ANDROMEDA NEBULA; GALAXY, EXTERNAL; MAGELLANIC CLOUDS; METAGALAXY.

Sanders, Prof. Frederick. *Massachusetts Institute of Technology.* JET STREAM; MONSOON; WIND; series of related articles.

Sanders, Harry. *Vice-Admiral (retired); Director, Antisubmarine Warfare Engineering, Chance Vought Aircraft, Inc.* ANTISUBMARINE WARFARE.

Sanders, Dr. Howard Lawrence. *Woods Hole Oceanographic Institution.* CEPHALOCARIDA.

Sandretto, Gen. Peter C. *International Telephone and Telegraph Corporation.* AIR TRAFFIC CONTROL; INSTRUMENT LANDING SYSTEM (ILS); NAVIGATION SYSTEMS, ELECTRONIC; other articles on electronic navigation systems.

Sannella, Joseph L. *Department of Biochemistry, Purdue University.* HEMICELLULOSE (in part).

Sargent, Lauren Francis. *Senior Consultant, H. B. Maynard and Company, Inc.* INVENTORY MANAGEMENT; PRODUCTION PLANNING.

Saul, Dr. Everett L. *Director of Scientific Liaison, Products Division, Bristol-Myers Company.* ESSENTIAL OILS; TERPENE; WOOD CHEMICALS; other articles on terpenes.

Saunders, Capt. Harold Eugene. *Former Technical Assistant to the Chief, Bureau of Ships, U.S. Navy Department.* SHIP SALVAGE.

- Saunders, Harry Merritt. Assistant Vice-President, Private Wire Services, Western Union Telegraph Company. TELEGRAPHY (in part).*
- Saunders, Prof. John W., Jr. Professor of Biology, Marquette University. INTIGUMENT (in part).*
- Saur, J. F. T. Oceanographer, U.S. Bureau of Commercial Fisheries. BERING SEA.*
- Savage, Dr. Donald Elvin. Professor of Paleontology and Chairman of the Department of Paleontology, University of California. EDENTATA FOSSILS; PROBOSCIDEA FOSSILS, articles on other fossil groups.*
- Savage, Dr. George Mason. Manager, Microbiological Research, The Upjohn Company. ANTIMICROBIAL AGENTS; NOVOBIOGIN.*
- Savage, Prof. Jay Mathers. Department of Biological Sciences, University of Southern California. SQUAMATA; articles on related taxonomic groups.*
- Sayre, Dr. Albert Nelson. Consulting Ground-Water Geologist associated with Behre Dolbear and Company. ATMOSPHERIC EVAPORATION; GROUND WATER; HYDROLOGY; other articles on hydrology.*
- Schaaf, Prof. Samuel A. Professor of Engineering Science; Chairman, Division of Aeronautical Sciences, University of California. SUPERAERODYNAMICS.*
- Schaefer, Dr. Milner Bailly. Director, Institute of Marine Resources, Scripps Institution of Oceanography. MARINE FISH-ERIES; MARINE RESOURCES.*
- Schaeffer, Dr. Bobb. The American Museum of Natural History. OSTRICHTHYES FOSSILS.*
- Schawlow, Prof. Arthur L. Department of Physics, Stanford University. LASER (in part).*
- Scheer, Prof. Bradley Titus. Professor, Biology Department, University of Oregon. BIOELECTRIC MODEL; CIRCULATION; ENDOCRINE MECHANISMS.*
- Schelleng, John C. Director of Radio Research (retired), Bell Telephone Laboratories, Inc. ANTENNA (AIRIAL); CORNER REFLECTOR ANTENNA; YAGI ANTENNA.*
- Schleicher, Richard L. Special Assistant to the Chief Engineer, North American Aviation, Los Angeles Division. AIRFRAME.*
- Schmerling, Dr. Louis. Research Associate, Universal Oil Products Company. ALKANE; HYDROCARBON, PETROLEUM, series of related articles.*
- Schmid, Prof. Rudi. University of Chicago Medical School. PORPHYRIN.*
- Schmidt, Dr. Paul W. Associate Professor of Physics, University of Missouri. COLLISION; CONSERVATION OF MOMENTUM; VIRTUAL WORK, PRINCIPLE OF; series of related articles.*
- Schmidt-Nielsen, Dr. Bodil Mimi. Department of Zoology, Duke University. URINARY SYSTEM (in part).*
- Schmitt, Dr. Waldo LaSalle. Research Associate, Department of Zoology, U.S. National Museum, Smithsonian Institution. CRUSTACEA.*
- Schneirla, Dr. T. C. Curator, Department of Animal Behavior, American Museum of Natural History. INSTINCTIVE BEHAVIOR.*
- Schoenherr, Dr. Karl Ernest. Technical Director (retired), Hydromechanics Laboratory, David Taylor Model Basin, Washington, D.C. CAVITATION.*
- Schour, Dean Isaac. College of Dentistry, University of Illinois. TOOTH.*

- Schrader, Prof. Franz. (Formerly) *Department of Zoology, Duke University*. MITOSIS.
- Schrank, Dr. A. R. *Department of Zoology, University of Texas*. PLANT MOVEMENTS.
- Schroeder, Dr. Charles Arthur *Department of Botany and Plant Biochemistry, University of California, Los Angeles*. FRUIT (TREE); articles on various tree fruits.
- Schubert, Dr. Jack. *Division of Biological and Medical Research, Argonne National Laboratory*. BERYLLIUM.
- Schule, John Joseph, Jr. *Acting Director, Marine Sciences Department, U.S. Naval Oceanographic Office*. HALOCLINE; SHIP ROUTING (in part); TEXAS TOWERS; THERMOCLINE.
- Schulman, Dr. James Herbert. *Chair of Materials Science, U.S. Naval Research Laboratory*. ELECTROLUMINESCENCE; LUMINESCENCE; other articles on luminescence and in theoretical physics (all co-authored).
- Schutt, Dr. Hermann C. *Consulting Engineer*. FURNACE CONSTRUCTION.
- Schwan, Harry T. *Vice-President, H. B. Maynard and Company*. OPERATOR TRAINING; WORK STANDARDIZATION.
- Schweizer, Ernest *President and Chief Engineer, Schweizer Aircraft Corporation*. GLIDER; SAILPLANE.
- Scotfield, Francis *Technical Director, National Paint, Varnish and Lacquer Association*. PAINT; PIGMENT, SURFACE COATING, series of related articles.
- Scott, Dr. J. Allen. *Extramural Programs, National Institute for Allergy and Infectious Diseases, N.I.H*. DICTYOPHYMOIDEA, DRACUNCULOIDEA; RHABDASOIDEA; TRICHUROIDEA.
- Scott, Dr. John Edward, Jr. *Professor of Aerospace Engineering, University of Virginia*. COMPRESSIBLE FLOW, SUPERSONIC FLIGHT.
- Scott, Dr. John Paul. *Research Professor in Psychology, Bowling Green State University*. SOCIAL ANIMALS, SOCIAL HIERARCHY.
- Scott, Dr. Richard Albert. *Denver Federal Center*. FOSSIL SEEDS AND FRUITS.
- Scott, Prof. Robert L. *Professor of Chemistry, University of California at Los Angeles*. BOILING POINT; EQUILIBRIUM, PHASE; SECOND-ORDER TRANSITION other articles on physical chemistry.
- Scott, Dr. Roderic M. *Vice-President and Corporate Chief Scientist, Perkin-Elmer Corporation, Norwalk, Connecticut*. ASTRONOMICAL INSTRUMENTS.
- Seaborg, Dr. Glenn T. *Chairman, Atomic Energy Commission*. ACTINIDE ELEMENTS; TRANSURANIUM ELEMENTS.
- Sears, Prof. Paul Bigelow. *Professor emeritus of Conservation, Department of Biology, Yale University*. POSTGLACIAL VEGETATION AND CLIMATE.
- Sebald, Joseph F. *Senior Consulting Engineer, Advance Products Division, Worthington Corporation*. CONDENSER, VAPOR; COOLING TOWER; STEAM JET EJECTOR; series of related articles.
- Sechler, Dr. Ernest E. *Professor of Aeronautics, California Institute of Technology*. SPACE TECHNOLOGY; SPACE VEHICLE.
- Seefeldt, Fred C. *Production Service Staff, Liquid Carbonic Division, General Dynamics Corporation*. CARBON DIOXIDE.
- Seelye, E. E. (Formerly) *Seelye Stevenson Value and Knecht, Consulting Engineers, New York*. AIRPORT ENGINEERING; RUNWAY, AIRPORT (both in part).
- Segrè, Prof. Emilio. *University of California*. ANTIMATTER; ANTINEUTRON; ANTIPROTON; NUCLEON; PROTON.

- Seifert, Dr. William Walther. *Professor of Electrical Engineering; Assistant Dean of Engineering, Massachusetts Institute of Technology.* ANALOG COMPUTER; DIFFERENTIAL ANALYZER; SLIDE RULE.
- Seiff, Alvin. *National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California.* BALLISTIC RANGE.
- Seitz, Prof. Frederick. *Chairman, Department of Physics, University of Illinois.* SOLID-STATE PHYSICS.
- Sekera, Prof. Zdenek. *University of California, Los Angeles.* METEOROLOGICAL OPTICS: articles on various phenomena.
- Selby, Dr. Cecily Cannan. *Headmistress, Lenox School, New York.* INTRODUCTION (in part).
- Sell, Heinz Georg. *Manager, Metals Research Section, Advanced Development Department, Westinghouse Electric Corporation, Lamp Division.* HEAT RADIATION, series of related articles (all co-authored).
- Sellers, Dr. John Randolph. *Director, Aeroscience Laboratory, TRW Systems.* AERONAUTICAL ENGINEERING; AERONAUTICS; AEROSTATICS; FLIGHT DYNAMICS; FLIGHT SCIENCE.
- Semmes, Dr. Josephine. *Research Psychologist, National Institutes of Mental Health.* AGNOSIA; AMNESIA; APHASIA; APRAXIA; ASTEREOGNOSIS.
- Serr, Prof. Eugene Frank, Jr. *Pomologist, University of California at Davis.* NUT CROP CULTURE; articles on various nuts.
- Setlow, Prof. Richard B. *Biology Division, Oak Ridge National Laboratory.* PHYSIOLOGICAL ACTION SPECTRA.
- Seubold, Dr. Frank H. *Division Manager, Space-General Corporation.* ANTIOXIDANT; INHIBITOR (CHEMICAL).
- Shapiro, Hymin. *Assistant Director of Chemical Research, Ethyl Corporation.* LEAD (in part).
- Sharpe, Dr. C. F. Stewart. *2837 Monroe Street, Falls Church, Virginia.* LANDSLIDE; MASS WASTING; other articles on geology.
- Sharvelle, Dr. Eric George. *Department of Botany and Plant Pathology, Purdue University.* FRUIT (TREE) DISEASES (in part).
- Shaw, Dr. Robert Alfred. *Department of Chemistry, Birkbeck College, University of London.* POLYMER, INORGANIC.
- Sheard, Dr. Keith. *Senior Research Officer, Division of Fisheries and Oceanography, Commonwealth Scientific and Industrial Research Organization, Australia.* INDIAN OCEAN (in part).
- Shearer, Prof. J. Lowen. *Systems and Controls Laboratory, Pennsylvania State University.* MAGNETIC AMPLIFIER; SERVO-MECHANISM; SYNCHRO.
- Sheffield, Dr. Fred D. *Professor of Psychology, Yale University.* EXTRASENSORY PERCEPTION (ESP).
- Shellenberger, Dr. John A. *Department of Flour and Feed Milling Industries, Kansas State University.* FOOD MANUFACTURING (in part); processing sections of various cereal grain articles.
- Shelton, Dr. Frank H. *Research Scientist, Kaman Nuclear Division of Kaman Aircraft Corporation.* NUCLEAR EXPLOSION (in part).
- Shepard, Prof. Francis Parker. *Scripps Institution of Oceanography, University of California.* SUBMARINE CANYON.
- Sheppard, Dr. Edith M. *Senior Lecturer in Zoology, University College of South Wales and Monmouthshire, Cardiff, Wales.* PHREATICOIDEA.

- Sheppard, Prof. P. A. *Imperial College, London, England.* METEOROLOGY (in part).
- Sherwood, Robert S. *Manager of Engineering, Steam Turbine Division, Worthington Corporation.* MACHINERY; MASS PRODUCTION; MECHANICAL ENGINEERING; TECHNOLOGY.
- Shiino, Dr. Prof. Sueo M. *Professor of Zoology, Faculty of Fisheries, Prefectural University of Mie, Japan.* CALIGOIDA; EPICARIDEA.
- Shirley, Prof. David Allen. *Department of Chemistry, University of Tennessee.* KETONE; articles on various ketones.
- Shive, Prof. William. *Department of Chemistry and the Clayton Foundation Biochemical Institute, University of Texas.* ENZYME INHIBITION
- Shnidman, Louis. *Director of Research, Rochester Gas and Electric Corporation.* FUEL GAS.
- Shomon, Dr. Joseph James. *Director, Nature Centers Division National Audubon Society.* WILDLIFE CONSERVATION.
- Shoop, Rue M. *Vice-President, Publicity, Multi-amp Electronic Corporation, Union, New Jersey.* ELECTRIC POWER SYSTEMS
- Showalter, Albert Kenneth. *Meteorologist, U.S. Weather Bureau.* WEATHER STATION
- Shreve, Prof. R. Norris. *Professor emeritus of Chemical Engineering, Purdue University.* NITRATION (in part); UNIT PROCESSES.
- Shrock, Prof. Robert Rakes. *Professor and Chairman, Department of Geology and Geophysics, Massachusetts Institute of Technology.* EARTH SCIENCES.
- Shubik, Dr. Philippe. *Division of Oncology, Chicago Medical School.* ONCOLOGY.
- Shuster, Dr. Carl Nathaniel, Jr. *Director, Northeast Research Center, U.S. Public Health Service; Research Associate, Graduate School of Oceanography, University of Rhode Island.* XIPHOSURA
- Siegel, Prof. Benjamin M. *Department of Engineering Physics, Cornell University.* MICROSCOPI, ELECTRON (in part).
- Siegfried, Prof. Laurence B. *Professor emeritus of Graphic Arts and Chairman of Graphic Arts Department, School of Journalism, Syracuse University.* PRINTING.
- Siever, Prof. Raymond. *Hoffman Laboratory, Harvard University.* SEDIMENTARY ROCKS, SEDIMENTATION (GEOLOGY); series of articles on sedimentary rocks.
- Silliker, Dr. John H. *Research Associate, St James Hospital, Chicago Heights, Illinois.* FOOD POISONING, BACTERIAL; FOOD SPOILAGE.
- Silver, Edward A. *Professional Agricultural Engineer.* AGRICULTURAL SOIL AND CROP PRACTICES.
- Silver, Dr. Seymour David. *Technical Director, U.S. Army Chemical Research and Development Laboratories.* CHEMICAL WARFARE; GAS MASK; INCENDIARY; SCREENING SMOKE.
- Simons, Dr. David G. *Chief, Veterans Administration Research Physical Medicine and Rehabilitation.* SPACE FLIGHT.
- Simons, Dr. Joseph H. *University of Florida.* FLUORINE.
- Simonson, Dr. Roy W. *Director, Soil Classification and Correlation Soil Survey, Soil Conservation Service, U.S. Department of Agriculture.* PEDOLOGY; SOIL (GREAT SOIL GROUPS)—in part.
- Simpson, Dr. F. J. *Bacteriologist, National Research Council of Canada.* LACTIC ACID.

- Simpson, Prof. Stephen G. *Associate Professor of Analytical Chemistry, Massachusetts Institute of Technology.* BALANCE (ANALYTICAL); GRAVIMETRIC ANALYSIS; QUANTITATIVE CHEMICAL ANALYSIS.
- Sinclair, Dr. Donald B. *President, General Radio Company.* ELECTRIC POWER MEASUREMENT (in part); ELECTRICAL MEASUREMENTS (in part); IMPEDANCE MEASUREMENTS, HIGH-FREQUENCY; articles on electrical instrumentation.
- Singer, S. F. *Dean, School of Environmental and Planetary Sciences, University of Miami.* SPACE (in part).
- Singer, Dr. Stanley. *Director, ATHENEX Research Associates.* PROPELLANT (in part).
- Sinnett, Chester Maxim. *Radio Corporation of America.* TELEVISION RECEIVER (in part).
- Sinnett, Dr. Edmund. *Sterling Professor emeritus of Botany, Dean emeritus of the Graduate School, Yale University.* PLANT MORPHOGENESIS.
- Siple, Dr. Paul Allman. *Scientific Advisor, U.S. Army Research Office.* ANTARCTICA.
- Sipley, Dr. Louis Walton. *Director, American Museum of Photography.* PRINTING PLATE (in part).
- Sisler, Dr. Harry Hall. *Professor and Chairman, Department of Chemistry, University of Florida.* AMMINE; AMMONIA. NITROGEN.
- Sistrom, William R. *Associate Professor of Biology, University of Oregon.* BACTERIAL GROWTH; MYXOBACTERIALES.
- Sittig, Marshall. *Consultant.* ALKALI METALS; articles on individual alkali metals.
- Sittner, Dr. W. R. *President, F.M.S. Consultants.* INFRARED DETECTOR; PHOTODIODE; PHOTOTRANSISTOR.
- Skaar, Dr. Christen. *Professor, College of Forestry, Syracuse University.* WOOD PHYSICS.
- Skerman, Prof. Victor Bruce Darlington. *Professor of Microbiology and Head, Department of Bacteriology, University of Queensland, Australia.* BACTERIA, TAXONOMY OF; SCHIZOMYCETES; articles on related taxonomic groups.
- Skell, Prof. Philip S. *Department of Chemistry, Pennsylvania State University.* CARBON COMPOUNDS, DIVALENT.
- Skovholt, Dr. Oscar. *Former Director of Laboratory, Quality Bakery of America Co-op, Inc.* FOOD MANUFACTURING (in part).
- Slabaugh, Dr. Wendell H. *Professor of Chemistry, Oregon State University.* INTERFACE OF PHASES; SURFACE-ACTIVE AGENT.
- Slater, Lloyd Edward. *Executive Director, Foundation for Instrumentation Education and Research.* FOOD ENGINEERING (in part).
- Slawson, Prof. Chester Baker. *Mineralogical Laboratory, University of Michigan.* DIAMOND; GEM, MANUFACTURED.
- Slaymaker, Frank H. *Engineering Specialist, Research Department, General Dynamics/Electronics.* PUBLIC ADDRESS SYSTEM; SOUND REPRODUCTION SYSTEMS, ELECTRICAL.
- Sleeper, Ruth. *Director, School of Nursing and Nursing Service, Massachusetts General Hospital, Boston.* NURSING.
- Slichter, Dr. Charles Pence. *Professor of Physics, University of Illinois.* MAGNETIC RELAXATION; MAGNETIC RESONANCE.
- Slichter, Prof. Louis B. *Institute of Geophysics, University of California at Los Angeles.* EARTH DEFORMATIONS AND VIBRATIONS; EARTH TIDES.



- Sloss, Prof. L. L. *Department of Geology, Northwestern University.* EVAPORITE (SALINE).
- Smack, John C. *Assistant to General Sales Manager, Curtis Wright Corporation.* METAL INSPECTION, ULTRASONIC.
- Smith, C. Price. *Director, Process Research and Development Laboratory, Radio Corporation of America.* KINSCOPE.
- Smith, D. W. E. *National Institutes of Health.* AMINO ACIDS (in part); HISTIDINE; LYSINE.
- Smith, Prof. David Martyn. *Professor of Silviculture, Yale University School of Forestry.* SILVICULTURE.
- Smith, Dr. F. G. Walton. *Director, Institute of Marine Science, University of Miami.* OCEANOGRAPHY (in part).
- Smith, Fred W. *Senior Engineer, Western Union Telegraph Company.* TELETYPEWRITER.
- Smith, Dr. Guy D. *Director, Soil Survey Investigations, Soil Conservation Service.* SOIL (in part).
- Smith, Prof. H. T. U. *Head of Geology Department, University of Massachusetts.* AERIAL PHOTOGRAPH.
- Smith, Harlan J. *Professor and Chairman of the Department of Astronomy, University of Texas.* JUPITER.
- Smith, Dr. Harold H. *Department of Biology, Brookhaven National Laboratory.* MENDELISM.
- Smith, Prof. Harry. *Professor of Microbiology, University of Birmingham, England.* ANTHRAX.
- Smith, James A. *Electric Utility Engineering, General Electric Company.* ELECTRIC POWER SUBSTATION.
- Smith, Prof. Karl Ulrich. *Psychology Department, University of Wisconsin.* AUDIOMETRY; DEAFNESS; HEARING; LOUDNESS; PITCH.
- Smith, Philip H. *Contributing Editor, Society of Automotive Engineers.* AUTOMOBILE; AUTOMOTIVE SUSPENSION; AUTOMOTIVE VEHICLE; series of related articles.
- Smith, Dr. Raymond Lloyd. *President, Michigan Technological University.* ZONE REFINING.
- Smythe, Dr. William Ralph. *Professor emeritus of Physics, California Institute of Technology.* ELECTROMAGNETIC RADIATION; MAXWELL'S EQUATIONS; WAVE EQUATION; other articles on electromagnetic theory.
- Snell, Dr. Arthur Hawley. *Assistant Director, Oak Ridge National Laboratory; Director, Thermonuclear Project, Oak Ridge National Laboratory.* NEUTRON; NEUTRON, DELAYED; NEUTRON CROSS SECTION; NEUTRON OPTICS.
- Snell, Prof. Esmond E. *Professor of Biochemistry, University of California, Berkeley.* BIOASSAY (in part).
- Snell, Dr. Fred M. *Professor of Biophysics, School of Medicine, State University of New York at Buffalo.* OPEN SYSTEMS; THERMODYNAMICS OF (BIOLOGY).
- Snodgrass, Frank E. *Scripps Institute of Oceanography, University of California at La Jolla.* OCEAN WAVES (in part).
- Snodgrass, Dr. Robert Evans. *Former Honorary Research Associate, Smithsonian Institution.* ARTHROPODA, ONYCHOPHORA.
- Snook, Dr. Theodore. *Professor of Anatomy, University of North Dakota School of Medicine.* TONSIL.
- Snyder, Dr. Thomas Elliott. *Research Associate, U.S. National Museum, Smithsonian Institution.* ISOPTERA.

- Soderberg, Adolph. *Consulting Mining Engineer, Western Mining Divisions, Kennecott Copper Corporation.* MINING, OPEN-CUT OR PIT.
- Sohon, Dr. Harry. (Formerly) *Moore School, University of Pennsylvania.* INDUCTANCE MEASUREMENT; PHASE-ANGLE MEASUREMENT; articles on electrical instrumentation.
- Solitare, Dr. Gilbert Bernard. *Department of Pathology, Yale University School of Medicine.* MUSCULAR SYSTEM DISORDERS.
- Sonensheim, N. *Captain (retired), U.S. Navy.* SHIP, NAVAL (in part).
- Sonett, Dr. Charles P. *National Aeronautics and Space Administration, Ames Research Center.* SPACE PROBE.
- Souders, Dr. Mott. *Former Director of Oil Development, Shell Development Company.* FRACTIONATING COLUMN; FUEL OIL; PETROLEUM PRODUCTS; other articles on petroleum chemistry.
- Spackman, Dr. William. *Department of Geology, Pennsylvania State University.* COAL PALEOBOTANY.
- Spangenberg, Dr. Karl Rudolph. *Former Senior Consulting Scientist, Research and Engineering, Lockheed Missiles and Space Company.* DIODE, VACUUM, PENTODE, VACUUM; TRIODE, VACUUM; VACUUM TUBE; articles on other electronic tubes.
- Spedding, Dr. Frank Harold. *Professor of Chemistry, Physics, and Metallurgy and Director, Institute for Atomic Research, Iowa State University; Director, Ames Laboratory of the Atomic Energy Commission.* RARE-EARTH ELEMENTS; articles on various rare-earth elements.
- Spencer, Dr. John Francis Theodore. *Senior Research Officer (Microbiologist), Engineering and Process Development Section, National Research Council, Canada.* ACETONE-BUTANOL FERMENTATION; ACETONE-ETHANOL FERMENTATION.
- Speyer, Dr. Joseph F. *Cold Spring Harbor Laboratory of Quantitative Biology.* RIBONUCLEIC ACID.
- Spindt, Dr. Roderick S. *Gulf Research and Development Company.* BURNING VELOCITY MEASUREMENT; COMBUSTION WAVE MEASUREMENT, SPECTROSCOPY OF COMBUSTION.
- Spink, Dr. Wesley William. *Professor of Medicine, University of Minnesota School of Medicine.* BRUCELLOSIS.
- Spinrad, Dr. Bernard I. *Division Director, Reactor Engineering Division, Argonne National Laboratory.* NUCLEONICS; REACTOR PHYSICS; THERMAL NEUTRONS.
- Sprague, Dr. George Fredrick. *Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture.* BREEDING (PLANT).
- Sprague, Prof. Howard B. *Head, Agronomy Department, Pennsylvania State University.* GRASS CROPS (in part); articles on various grasses.
- Spratt, Dr. Nelson Tracy. *Chairman, Department of Zoology, University of Minnesota.* FETAL MEMBRANE; GASTRULATION; GERM LAYERS; articles on other fetal membranes.
- Sprenkle, Raymond E. *Director of Education (retired), Bailey Meter Company.* ORIFICE, VENTURI TUBE.
- Spurr, Prof. Stephen H. *School of Natural Resources, University of Michigan.* ECOLOGY, APPLIED; FOREST ECOLOGY; FOREST MAPPING.
- Squire, Prof. Charles Francis. *Associate Dean of Science, Agricultural and Mechanical College of Texas.* ABSOLUTE ZERO; LOW-TEMPERATURE PHYSICS.
- Srb, Prof. Adrian Morris. *Division of Biological Sciences, Cornell University.* DOMINANCE, RECESSIVENESS, BLENDING.

Stadie, Dr. William C. (Formerly) *Maloney Clinic, University of Pennsylvania*. LIPID METABOLISM.

Stahnke, Dr. Herbert Ludwig. *Director, Poisonous Animals Research Laboratory; Professor of Zoology, Arizona State University*. SCORPIONIDA.

Stakman, Dr. E. C. *Professor emeritus, University of Minnesota*. PLANT DISEASE; PLANT DISEASE CONTROL (both in part).

Standiford, Ferris Charles, Jr. *W. L. Badger Associates, Inc., Consulting Engineers*. EVAPORATOR.

Stansbury, Dr. Harry Adams, Jr. *Research Chemist, Union Carbide Corporation, Olefins Division*. ACETALDEHYDE; ALDEHYDE; BENZALDEHYDE; FORMALDEHYDE.

Stapleton, Dr. George Edward. *Research Biologist, Biology Division, Oak Ridge National Laboratory*. RADIATION MICROBIOLOGY.

Starc, Prof. Fredrick J. *Department of Nutrition, Harvard University*. NUTRITION.

Starr, Eugene C. *Consulting Engineer, Bonneville Power Administration*. ELECTRIC POWER TRANSMISSION.

Steacie, Dr. E. W. R. *Former President, National Research Council of Canada*. FREE RADICAL.

Stebbins, Prof. G. Ledyard. *Department of Genetics, College of Agriculture, University of California at Davis*. PLANT EVOLUTION.

Steele, Dr. John Gordon. *Technical Officer, Soil Survey, Food and Agricultural Organization of the United Nations, British Guiana*. SOIL (GREAT SOIL GROUPS) in part.

Steenrod, Prof. Norman Earl. *Professor of Mathematics, Princeton University*. FIBER BUNDLE.

Stegenga, Prof. F. R. *Professor of Physiology, University of Illinois*. DIGESTIVE SYSTEM (in part).

Stehle, Prof. Philip McLellan. *Professor of Physics, University of Pittsburgh*. CANONICAL TRANSFORMATIONS; HAMILTON'S EQUATIONS OF MOTION; LAGRANGE'S EQUATIONS; other articles on classical mechanics.

Steinberg, Prof. Arthur G. *Department of Biology, Western Reserve University*. HUMAN GENETICS (in part).

Steinberg, Dr. Daniel. *Chief, Laboratory of Metabolism, National Heart Institute*. PROTEIN; articles on various proteins.

Steinberg, Dr. Ellis Philip. *Senior Chemist, Argonne National Laboratory*. NUCLEAR CHEMISTRY.

Steinert, Emil F. *Arc Welding Division, Westinghouse Electric Corporation*. ARC WELDING.

Steinhaus, Prof. Edward A. *Dean of Biological Sciences, University of California*. INSECT CONTROL, BIOLOGICAL, INSECT PATHOLOGY.

Stephen, Dr. A. C. *Former Keeper, Natural History Department, Royal Scottish Museum, Edinburgh, Scotland*. ECHINUROIDEA; PRIAPULIDA.

Stephens, Dr. Charles R. *Associate Director, Chemical Research and Development, Charles Pfizer and Company*. OXYTETRACYCLINE.

Stephenson, Prof. Richard M. *University of Connecticut*. ISOTOPE SEPARATION (STABLE ISOTOPES).

Stepniewski, Wieslaw Zenon. *Director of Advanced Research, Vertol Division, Boeing Airplane Company*. CONVERTIPANE.

Stergis, Dr. C. G. *Chief, Upper Atmosphere Physics Laboratory, AFCLRL*. AERONOMY.

- Stern, Prof. Herbert. *Department of Biology, University of California, La Jolla.* CELL PROTOPLAST.
- Stern, Joseph A. *Space Division, Boeing Company* FOOD MANUFACTURING (in part).
- Sturner, Dr. John. *Vice-President, Cordis Corporation.* LAUNCHING PAD COMPLEX.
- Stevens, John E. *Director, Design Engineering Research and Advanced Development Division, AVCO Corporation.* LANDING GEAR.
- Stevenson, Dr. Robert E. *Bureau of Commercial Fisheries, Biological Laboratory, Galveston.* ESTUARINE OCEANOGRAPHY (in part).
- Stewart, Dr. David B. *U.S. Geological Survey* SILICATE PHASE EQUILIBRIA.
- Stewart, Dr. Grace Anne. *Professor emeritus of Geology.* DEVONIAN.
- Stewart, Dr. John Westcott. *Department of Physics, University of Virginia.* DIMENSIONAL ANALYSIS; ELECTRICAL STANDARDS; REFRACTIONS OF WAVES; series of articles on electricity.
- Stewart, Prof. Wilson Nichols. *Department of Botany, University of Illinois* COAL BALLS; PTERIDOSPERMAE.
- Stiles, Dr. R. Martin. *Professor, Department of Chemistry, University of Michigan.* TROPOLONE.
- Stillwell, Dr. G. Keith. *Mayo Clinic; Mayo Graduate School of Medicine, University of Minnesota* THERMOTHERAPY (in part).
- Stinton, Prof. Ruben Arthur. *Director, Museum of Paleontology, University of California, Berkeley.* MAMMALIA FOSSILS; articles on related fossil groups.
- Stoeckeler, Dr. J. H. *Lake States Forest Experiment Station, University Farm, St. Paul, Minnesota.* FOREST SEEDING AND PLANTING.
- Stokes, Prof. J. L. *Department of Bacteriology and Public Health, Washington State University.* BACTERIAL NUTRITION.
- Stommel, Prof. Henry M. *Harvard University.* GULF STREAM.
- Stone, Dr. Kenneth G. *Professor of Chemistry, Michigan State University.* ORGANIC QUANTITATIVE ANALYSIS; REAGENT CHEMICALS; STOICHIOMETRY; other articles on analytical chemistry.
- Stone, Prof. Leon Stansfield. *Bronson Professor of Comparative Anatomy, Yale University.* BEHAVIOR, ONTOGENY OF; EYE; NERVOUS SYSTEM (all in part).
- Storch, Dr. Henry Herman. *Former Assistant Professor of Chemistry, New York University.* COAL CHEMICALS; COAL GASIFICATION; FISCHER-TROPSCH PROCESS; related articles on chemical engineering.
- Storer, Prof. Tracy I. *Professor emeritus of Zoology, Department of Zoology, University of California at Davis.* Series of articles on various topics in zoology.
- Stoltz, Prof. Elmer H. *University of Rochester School of Medicine and Dentistry.* CYTOCHROME.
- Stoutemeyer, Prof. Vernon T. *Chairman, Department of Agricultural Sciences, University of California at Los Angeles.* ORNAMENTAL PLANTS (in part).
- Stover, Prof. Harold Earl. *Professor and Extension Agricultural Engineer, Kansas State University.* RURAL SANITATION.
- Strachan, Dr. Isles. *Lecturer in Geology, University of Birmingham, England.* GRAPTOLITHINA.

- Strain, Dr. Harold H. *Senior Chemist, Argonne National Laboratory.* CAROTENOID; CHROMATOGRAPHY.
- Strandberg, Prof. Malcom W. P. *Professor of Physics, Massachusetts Institute of Technology.* MICROWAVE SPECTROSCOPY.
- Strandtmann, Prof. Russell William. *Texas Technological College.* MESOSTIGMATA (in part).
- Stranks, Prof. Donald Richard. *Professor of Inorganic Chemistry, Department of Physical and Inorganic Chemistry, University of Adelaide, South Australia.* RADIOCHEMISTRY.
- Straus, Dr. Reuben. *Director of Laboratories and Research, Saint Joseph Hospital, Burbank, California.* CLINICAL PATHOLOGY.
- Strausbaugh, Dr. P. D. *Professor emeritus of Botany, West Virginia University.* METACHYLAMYDIACE; TRIURIDACE; series of articles on plant taxonomy.
- Strayer, George Martin. *Executive Vice-President and Secretary-Treasurer, American Soybean Association, Executive Director, Soybean Council of America, Inc.* SOYBEAN (in part).
- Streeter, Prof. Victor L. *University of Michigan.* FLUID MECHANICS; PIPE FLOW, SOURCE FLOW; other articles on fluid mechanics.
- Strock, Clifford. *Consulting Editor, 'Air Conditioning, Heating and Ventilating.'* DEGREE-DAY.
- Stroke, Dr. George W. *University of Michigan.* DOPPLER EFFECT, LIGHT.
- Stuart, Dr. Edward G. *Associate Professor of Pathology, Associate Dean of Medicine, Director of Institute of Biological Sciences, West Virginia University.* Series of articles on anatomy and on human pathology.
- Stuart, Prof. L. C. *Department of Zoology, University of Michigan.* ZOOGEOGRAPHIC REGION, ZOOGEOGRAPHY.
- Stuart, William T. *Editor, 'McGraw-Hill Publishing Company.* CONDUCTOR, ELECTRIC; CONNECTOR, ELECTRIC; WIRING (ELECTRIC). other articles on electric circuits.
- Stumm, Prof. Erwin Charles. *Department of Geology and Mineralogy and Museum of Paleontology, University of Michigan.* RUGOSA; TABULATA.
- Stunkard, Dr. Horace Wesley. *Research Associate, Invertebrate Zoology, American Museum of Natural History.* PARASITOLOGY.
- Sturges, Frank Caleb. *President, Pennsylvania Drilling Company, President, Foundation Associates, Inc.; President, Lake Drilling Company; President, Triangle Pump and Supply Company.* BORING AND DRILLING, MINERAL; CORE DRILLING; WELL LOGGING (MINERAL).
- Sturtevant, Prof. Alfred H. *Thomas Hunt Morgan Professor emeritus of Biology, California Institute of Technology.* GENETICS.
- Sturtevant, George Rodger. *Manager (retired), Engineering, Meter Department, General Electric Company.* ELECTRIC ENERGY MEASUREMENT; WATT-HOUR METER.
- Suess, Prof. Hans E. *University of California at La Jolla.* ELEMENTS (COSMIC ABUNDANCE).
- Sully, Dr. Arthur H. *Director of Research and Development, English Steel Corporation Ltd., Sheffield, England.* MANGANESE.
- Summerbell, Robert K. *Former Professor of Chemistry, Northwestern University.* DIOXANE; ETHER; ETHYLENE OXIDE.
- Summers, Dr. Thomas Eugene. *Agricultural Research Service, Crops Research Division, U.S. Department of Agriculture.* ABACA; JUTE (in part); RAMIE (in part); SISAL.

*Suomi, Dr. Verner E. Department of Meteorology, University of Wisconsin. METEOROLOGICAL INSTRUMENTATION; other articles on meteorological instrumentation.*

*Suter, Dr. Hans H. Texaco, Calgary, Canada. MUD VOLCANO.*

*Sutherland, J. R. Large Power Transformer Engineering, General Electric Company. AUTOTRANSFORMER; TRANSFORMER (in part).*

*Sutton, George P. Chief Scientist, Advanced Research Projects Agency, U.S. Department of Defense. INTERPLANETARY PROPULSION; ROCKET; ROCKET ENGINE; ROCKET STAGING.*

*Swanson, Prof. Carl P. Department of Biology, Johns Hopkins University. CHROMOSOME THEORY OF HEREDITY; MEIOSIS; RADIATION CYTOLOGY; SYNGAMY.*

*Swanson, Dr. Carroll Arthur. Professor of Botany, Ohio State University. PLANT TRANSLOCATION (ORGANIC SOLUTES).*

*Swern, Dr. Daniel. Professor of Chemistry, Temple University. HYDROXYLATION REACTION.*

*Switzer, Dr. George. Chairman, Department of Mineral Sciences, Division of Mineralogy and Petrology, Smithsonian Institution. CALICHE; NITER; NITRATE MINERALS; SODA NITER.*

*Sylvester, Dr. John Carl. Research Specialist, Infectious Disease, Abbott Laboratories. FUMAGILLIN.*

## T

*Tabor, Paul. Soil Conservation Service, U.S. Department of Agriculture (retired). COWPEA (in part); KUDZU; LEGUME FORAGES; LESPEDEZA; LUPINIL.*

*Tager, Prof. Morris. Department of Bacteriology and Immunology, Emory University. VIRULENCE.*

*Tait, Dr. John Barclay. Oceanographer, Marine Laboratory, Department of Agriculture and Fisheries for Scotland. NORTH SEA.*

*Tang, Prof. K. Y. (Formerly) Department of Electrical Engineering, Ohio State University. COUPLED CIRCUITS; NETWORK THEORY, ELECTRICAL; other articles on electric circuits.*

*Tanner, Dr. Fred W., Jr. Research Biochemist, Charles Pfizer and Company, Inc. CARBOMYCIN.*

*Tarboux, Prof. Joseph G. (Formerly) Electrical Engineering Department, University of Michigan. RELAY.*

*Tattersall, Dr. Olive Selden. Research Zoologist, Hayling Island, England. MYSIDACEA.*

*Taubc, Prof. Henry. Department of Chemistry, Stanford University. OXIDATION-REDUCTION.*

*Tauber, Dr. Michael E. Research Scientist, Ames Research Center, National Aeronautics and Space Administration. REENTRY.*

*Taylor, Prof. Angus Ellis. Professor of Mathematics, University of California, Los Angeles. CALCULUS, DIFFERENTIAL AND INTEGRAL; DIFFERENTIATION; PARAMETRIC EQUATION; PARTIAL DIFFERENTIATION.*

*Taylor, Dr. Gordon S. Tobacco Laboratory, Connecticut Agricultural Experiment Station. TOBACCO (in part).*

*Taylor, Prof. J. Herbert. Institute of Molecular Biophysics, Florida State University. AUTORADIOGRAPHY; HISTORADIOGRAPHY; NUCLEAR RADIATION (BIOLOGY)—in part.*

*Tedford, Dr. Richard Hall. Assistant Professor of Geology, Department of Geological Sciences, University of California, Riverside. CARNIVORA FOSSILS; PERISSODACTYLA FOSSILS; articles on related fossil groups.*

*Telcki, Prof. Geza. Professor of Geology, George Washington University. EUROPE.*

*Tenney, Dr. Gerold H. Los Alamos Scientific Laboratory, New Mexico. RADIOGRAPHY OF METALS.*

- Thalmann, Prof. Dr. Hans Ernst. *Visiting Professor of Paleontology, Stanford University (and University of Chile).* FORAMINIFERA FOSSILS.
- Thoma, Dr. Richard William. *Squibb Institute for Medical Research.* STEROID (in part).
- Thoma, Roy Elliott, Jr. *Research Chemist, Oak Ridge National Laboratory.* FUSED-SALT PHASE EQUILIBRIA (in part).
- Thomas, Dr. Morgan David. *Associate Professor of Geography, University of Washington.* MINERAL RESOURCES CONSERVATION.
- Thompson, Prof. Gerald Luther. *Professor of Applied Mathematics and Industrial Administration, Graduate School of Industrial Administration, Carnegie Institute of Technology.* GAME THEORY.
- Thompson, Dr. M. L. *Principal Geologist, Illinois State Geological Survey.* FUNGIFIDAE.
- Thompson, Dr. Stanley Gerald. *Senior Staff Member, Lawrence Radiation Laboratory, University of California.* BERKELIUM; CALIFORNIUM; EINSTEINIUM; FERMIUM; MENDELEVIUM.
- Thomsen, Dr. John S. *Physics Department, Johns Hopkins University.* ATOMIC CONSTANTS, X-UNIT (both in part).
- Thomson, Dr. Harry C. *Former Ordnance Historian, U.S. Department of the Army.* ARMAMENT, ARMY.
- Thomson, Prof. Robb Milton. *Departments of Metallurgy and Physics, University of Illinois.* ALLOY STRUCTURES; CRYSTAL DEFECTS, GRAIN BOUNDARIES (METALLURGY); TWINNING (CRYSTALLOGRAPHY).
- Thorne, Prof. Gerald. *Professor of Plant Pathology and Zoology, University of Wisconsin.* DORYAIMOIDEA.
- Thurston, Dr. H. David. *Rockefeller Foundation, Bogota, Colombia.* PLANT DISEASE CONTROL; POTATO, IRISH (both in part).
- Thwaites, Fredrik Turville. *Assistant Professor emeritus, Department of Geology, University of Wisconsin.* GLACIATED TERRANE; articles on various glaciated formations.
- Tikofsky, Dr. Ronald Sherwood. *Speech Clinic, Mental Health Research Institute, Center for Language and Language Behavior, University of Michigan.* SPEECH (in part).
- Tilton, Dr. George Robert. *Department of Geology, University of California, Santa Barbara.* LEAD ISOTOPES, GEOCHEMISTRY OF.
- Tippo, Dr. Oswald. *Provost, University of Massachusetts.* STEEL; WOOD (ANATOMY AND IDENTIFICATION).
- Tobias, Prof. Julian Morris. *(Formerly) Department of Physiology, University of Chicago.* BIOPOTENTIALS AND ELECTROPHYSIOLOGY; ELECTRODIAGNOSIS; ELECTROTHERAPY.
- Toensing, Dr. Clarence H. *Alleghany Ludlum Steel Company, Inc.* TUNGSTEN.
- Toland, Dr. William G. *Chevron Chemical Company.* OXIDATION PROCESS.
- Tompkins, Prof. Charles B. *Department of Mathematics, University of California at Los Angeles.* CALCULUS OF VARIATIONS.
- Torrey, Dr. Theodore W. *Department of Zoology, Indiana University.* URINARY SYSTEM (in part).
- Townes, Prof. Charles Hard. *Massachusetts Institute of Technology.* MASER.
- Tracy, Dr. Paul Hubert. *Professor emeritus, University of Illinois.* CASEIN; CHEESE (in part); ICE CREAM (in part); MILK (in part); RENNIN.
- Trauberman, Leonard. *Associate Editor, 'Food Engineering.'* FOOD ENGINEERING (in part).

- Treffers, Prof. Henry P. *Professor of Microbiology, Yale University.* IMMUNITY; SKIN TEST; series of articles on immunology.
- Treybal, Dr. Robert E. *Professor of Chemical Engineering, New York University.* SOLVENT EXTRACTION.
- Troost, Prof. Laurens. *Professor and Head (retired), Department of Naval Architecture and Marine Engineering, Massachusetts Institute of Technology.* PROPELLER, MARINE.
- Trowbridge, Dr. Arthur Carleton. *Professor emeritus of Geology, State University of Iowa.* COASTAL PLAIN.
- Tuax, Robert G. *Captain, U.S. Navy (retired); Aeroset-General General Corporation.* ASTRONAUTICAL ENGINEERING; ASTRONAUTICS; MISSILE.
- Trump, Prof. John George. *Massachusetts Institute of Technology.* IMPULSE GENERATOR.
- Truxal, Dr. John G. *Dean of Engineering, Polytechnic Institute of Brooklyn.* OPEN-LOOP CONTROL SYSTEM; TELEMETERING; articles on other control systems.
- Tsuchiya, Prof. Henry M. *Department of Chemical Engineering, University of Minnesota.* DEXTRAN.
- Tuck, James L. *Associate Division Leader, Los Alamos Scientific Laboratory, New Mexico.* PINCH EFFECT.
- Turkey, Dr. Harold Bradford. *Professor emeritus, Department of Horticulture, Michigan State University.* Series of articles on various edible fruits.
- Tully, Dr. John P. *Pacific Oceanographic Group, Fisheries Research Board of Canada.* ARCTIC OCEAN, NORTHWEST PASSAGE.
- Turekian, Dr. Karl K. *Professor of Geology, Yale University.* ELEMENTS (GEOCHEMICAL DISTRIBUTION).
- Turnbull, Dr. David. *Harvard University.* CRYSTAL GROWTH; other articles on crystallography.
- Turner, Prof. C. Donnell. *Professor of Biology, Duquesne University.* Physiology section on each of the endocrine glands.
- Turner, Dr. Charles Wesley. *Professor of Dairy Husbandry, University of Missouri.* LACTATION; MAMMARY GLAND.
- Turner, Prof. Gleason N. *Professor of Agricultural Engineering, Cornell University.* RURAL ELECTRIFICATION.
- Turner, Dean Lewis. (Formerly) *Utah State University.* RANGE LAND CONSERVATION.
- Turner, Dr. Richard J. *Technical Director, American Cyanamid Company.* FOLIC ACID (in part).
- Turner, Dr. Thomas B. *Johns Hopkins University School of Medicine.* SPIROCHETE; SYPHILIS; articles on various spirochetal infections.
- Turnwald, Wolfgang. (Formerly) *Nordberg Manufacturing Company.* STEAM; STEAM ENGINE.
- Tuteur, Prof. Franz B. *Department of Engineering and Applied Science, Yale University.* VIBRATOR.
- Tuttle, Alan H. *Design Engineer, Worthington Corporation.* LATHE; MACHINING OPERATIONS; WOODWORKING; articles on various machining operations.
- Tuttle, Dr. W. Norris. *General Radio Company.* CURRENT MEASUREMENT (in part); DIGITAL VOLTMETER; VACUUM-TUBE VOLTMETER, VOLTAGE MEASUREMENT (in part).
- Tyler, Prof. Albert. *Division of Biology, California Institute of Technology.* REPRODUCTION, ANIMAL; series of related articles.
- Tyler, Ivan L. *Research Counselor (retired), Research and Development Laboratories, Portland Cement Association.* GROUT; GUNITE.



Tyler, John E. *Scripps Institution of Oceanography, University of California*. SEA WATER (in part).

## U

Uchida, Dr. Tohru. *Professor of Zoology, Hokkaido University, Japan*. SCYPHOZOA; articles on related taxonomic groups.

Udy, Dr. Marvin J. (Formerly) *Strategic-Udy Processes, Inc., Engineers*. CHROMIUM.

Underwood, Prof. Benton J. *Northwestern University*. VISUAL LEARNING.

Upton, Dr. Arthur Canfield. *Biology Division, Oak Ridge National Laboratory*. RADIATION INJURY (BIOLOGY).

Usinger, Prof. Robert Leslie. *Division of Entomology and Acarology, University of California, Berkeley*. HEMIPTERA.

## V

Valleau, Dr. William Dorney. *Distinguished Professor of Plant Pathology, University of Kentucky*. TOBACCO (in part).

Vallentyne, Prof. John R. *Professor of Biology, Cornell University*. BIOSPHERE, BIOSPHERE, GEOCHEMISTRY OF.

Van Allen, Dr. J. A. *University of Iowa*. VAN ALLEN RADIATION.

Van Andel, Dr. Tjeerd Hendrik. *Scripps Institution of Oceanography, University of California*. DELTA (in part). HEAVY MINERALS, MARINE SEDIMENTS (in part).

Van Campenhout, Prof. Ernest L. *Professor of Anatomy, Histology, Embryology, University of Louvain School of Medicine, Belgium*. PANCREAS (in part).

van de Kamp, Dr. Peter. *Professor of Astronomy; Director, Sproul Observatory, Swarthmore College*. ASTROMETRY, PARALLAX (ASTRONOMY).

Van Dorn, Dr. William G. *Scripps Institution of Oceanography, University of California*. TSUNAMI.

Van Dyke, Prof. John Howard. *Professor of Anatomy, Hahnemann Medical College*. ULTIMOBRANCHIAL BODIES.

Van Fleet, Dr. D. S. Head. *Department of Botany, University of Georgia*. CORTIX, PLANT; ENDODERMIS, HYPODERMIS.

Van Niel, Dr. Cornelis B. *Herzstein Professor emeritus of Biology, Hopkins Marine Station of Stanford University; BACTERIOLOGY, FERMENTATION; MICROBIOLOGY, RHODOBACTERIACEAE*.

Van Slyke, Dr. Donald Dexter. *Brookhaven National Laboratory*. BIOCHEMISTRY.

Van Wazer, Dr. John R. *Senior Scientist and Research Director, Monsanto Company*. PHOSPHORUS.

Van Winkle, Prof. Quentin. *Department of Chemistry, Ohio State University*. DIALYSIS; ELECTROKINETIC PHENOMENA; other articles on colloidal chemistry.

Vander Velde, Prof. Wallace E. *Massachusetts Institute of Technology*. CYBERNETICS.

Vanderzee, Prof. Cecil E. *Department of Chemistry, University of Nebraska*. COUNTERCURRENT MASS-TRANSFER OPERATION; EQUILIBRIUM, CHEMICAL.

Vanick, James S. *Consultant, Foundry-Castings*. CAST IRON.

Varner, Prof. Joseph E. *Michigan State University-Atomic Energy Commission Plant Research Laboratory*. PLANT METABOLISM.

Vaughan, Dr. Edward Kemp. *Department of Botany and Plant Pathology, Oregon State College*. CURRANT; RASPBERRY (both in part).

Vaughan, Virginius N., Jr. *Data and Teletypewriter Planning Engineer, American Telephone and Telegraph Company*. DATA COMMUNICATIONS; TELEGRAPHY (in part); TELETYPE-SETTER; TELETYPEWRITER EXCHANGE (TWX) SERVICE.

Vaughan, Prof. Wyman Ristine. *Department of Chemistry, University of Michigan*. ISOMERISM, MOLECULAR; OPTICAL ACTIVITY; STEREOCHEMISTRY; other articles on stereochemistry.

Velick, Prof. Sidney Frederick. *Department of Biological Chemistry, University of Utah College of Medicine*. BIOLOGICAL OXIDATION.

Ver Wiebe, Prof. Walter A. *Former Professor of Petroleum Geology, University of Wichita*. NATURAL GAS.

Vernon, Edward M. *Manager, Weather Analysis and Prediction Division, U.S. Weather Bureau*. WEATHER (FORECASTING AND PREDICTION) - in part.

Verwey, Dr. W. F. *Professor and Chairman, Department of Microbiology, University of Texas Medical Branch*. BIOLOGICALS; articles on infections caused by hemophilic bacteria.

Vesper, Dr. Harold Gould. *Chemist, Shell Development Company*. PETROCHEMICAL (in part).

Vestal, Prof. Paul A. *Rollins College*. Series of taxonomic articles on lower plant groups.

Vestine, Dr. Ernest Harry. *Rand Corporation*. AERONOMY.

Vestling, Dr. Carl S. *Professor and Head of Department of Biochemistry, University of Iowa*. ENERGY METABOLISM

Vidone, Dr. Romeo Albert. *Assistant Professor, Department of Pathology, Yale University School of Medicine*. CIRCULATION DISORDERS; articles on various circulation disorders.

Vierheller, Prof. Albert Frank. *Extension Horticulturist (retired), Professor of Horticulture, University of Maryland*. HORTICULTURAL CROPS.

Vincent, Sydney Archibald. *Consulting Naval Architect*. SHIP, MERCHANT.

Vine, Allyn C. *Physical Oceanographer, Woods Hole Oceanographic Institution*. BATHYTHERMOGRAPH; OCEAN CURRENTS (in part); SEA WATER (in part).

Vishniac, Dr. Wolf. *Department of Biology, University of Rochester*. THIOBACTERIACEAE. ‡

Voigt, Dr. G. K. *Professor of Forest Soils, School of Forestry, Yale University*. FOREST SOIL; FOREST TREE NURSERY MANAGEMENT.

Vokac, Charles W. *Manager, Metallurgical Equipment Division, Whiting Corporation*. ARC HEATING.

Volk, Prof. Wesley A. *Department of Microbiology, University of Virginia School of Medicine*. BACTERIAL COENZYME; BACTERIAL ENZYME (both in part).

Vollum, Howard. *President, Tektronix, Inc.* OSCILLOSCOPE, CATHODE-RAY.

von Doenhoff, Albert E. *Staff Scientist, National Aeronautics and Space Administration*. AIRFOIL; AIRFOIL PROFILE; ASPECT RATIO.

Vonnegut, Dr. Bernard. *Arthur D. Little, Inc.* ATMOSPHERIC ELECTRICITY.

Voss, Dr. Gilbert L. *Professor of Marine Biology, Institute of Marine Science*. CEPHALOPODA; articles on related taxonomic groups

## W

Wackerman, Prof. Albert E. *Professor of Forest Utilization, Duke University School of Forestry*. LOGGING (FORESTRY); LUMBER MANUFACTURE.

Waddington, Dr. Thomas Cudworth. *Professor of Molecular Sciences, University of Warwick, England*. Series of articles on various topics in chemistry.

Waelisch, Prof. Salome G. *Albert Einstein College of Medicine, New York*. MUTATION (ONTOGENY).

Wagner, Prof. Dr. Carl. *Max Planck Institut für physikalische Chemie, Germany*. LIEBIGIAN RINGS.

Wagner, Dr. Robert P. *Professor of Zoology, University of Texas.* GENE ACTION (in part).

Wahl, Dr. Floyd Michael. *Associate Professor, Department of Geology, University of Illinois.* CLAY; CLAY MINERALS; articles on related minerals (all co-authored).

Wahlstrom, Prof. Ernest Eugene. *Professor of Geology, University of Colorado.* PETROGRAPHY.

Waidelich, Prof. Donald L. *Professor, Department of Electrical Engineering, University of Missouri.* POWER SUPPLY, ELECTRONIC; RECTIFIER; VOLTAGE REGULATOR (in part): series of related articles.

Waksman, Dr. Selman Abraham. *Professor emeritus, Institute of Microbiology, Rutgers University.* ACTINOMYCETACEAE; ACTINOMYCETALES, NEOMYCIN; STREPTOMYCETACEAE; STREPTOMYCIN.

Waldron, Dr. Robert D. *Research Scientist, The Garrett Corporation.* DIELECTRIC CONSTANT; DIELECTRICS; series of related articles.

Walker, Dr. Donald Gregory. *Associate Professor of Anatomy, Johns Hopkins School of Medicine.* SKELETAL SYSTEM (in part).

Walker, Dr. Warren Franklin, Jr. *Department of Biology, Oberlin College.* MUSCULAR SYSTEM (in part).

Wall, James Robert. *Senior Scientist, Alcoa Research Laboratories, Aluminum Company of America.* GALLIUM.

Wallace, Dr. James Merrill. *Professor of Plant Pathology, University of California, and Plant Pathologist, Citrus Research Center.* FRUIT (TREE) DISEASES (in part).

Walsh, Prof. Joseph Leonard. *Perkins Professor of Mathematics, Harvard University.* COMPLEX NUMBERS AND COMPLEX VARIABLES. CONFORMAL MAPPING; LAPLACE'S DIFFERENTIAL EQUATION.

Walsh, Dr. Peter Joseph. *Research Department, Lamp Division, Westinghouse Electric Corporation.* HEAT RADIATION, series of related articles (all co-authored).

Walter, William C. *Manager, Advanced Programs, Space and Information Systems Division, North American Aviation Inc.* AERODYNAMICS; AEROMECHANICS.

Wang, Professor William S-Y. *Division of Linguistics, Ohio State University.* SPEECH (in part).

Ware, Dr. J. O. *College of Agriculture, University of Arkansas.* COTTON (in part)

Warren, Prof. Bertram E. *Massachusetts Institute of Technology.* X-RAY DIFFRACTION (in part).

Wartik, Prof. Thomas. *Pennsylvania State University* BORANE.

Warwick, Dr. James Walter. *Department of Astro-Geophysics, University of Colorado.* ASTRONOMICAL GEOPHYSICS.

Watkins, Dr. Thomas D. *Chabot College, Hayward, California.* GOAT; MOHAIR; SHEEP; WOOL (in part).

Watson, Prof. William W. *Department of Physics, Yale University.* ATOMIC PHYSICS; AUGER EFFECT; MOLECULAR PHYSICS; NUCLEAR PHYSICS.

Wattenberg, Ben. *President, Fairfield Publishers, Inc.* HARBOR; INLAND WATERWAYS TRANSPORTATION.

Watterson, Dr. Ray L. *Department of Zoology, University of Illinois.* BLASTULATION; CLEAVAGE, EMBRYONIC

Weaver, Dr. E. Eugene. *Research Scientist, Scientific Laboratory, Ford Motor Company.* Series of articles on various topics in chemistry.

Weaver, James L. (Formerly) *Electron Tube Division, Radio Corporation of America.* PHOTOTUBE; PHOTOTUBE, MULTIPLIER.

- Weaver, Prof. Paul. *Professor (retired), Agricultural and Mechanical College of Texas.* OIL-FIELD MODEL.
- Weaver, S. E. *Northrop Aircraft, Inc.* DRONE; PARACHUTE.
- Webb Prof. J. E. *Professor of Zoology, University College, Ibadan Nigeria.* CEPHALOCHORDATA.
- Webb David C. *Associate Director, Stanford University Library.* PHOTOCOPYING PROCESSES.
- Weber, Edwin L. *Consulting Engineer.* HOT-WATER HEATING SYSTEM; PANEL HEATING AND COOLING; RADIANT HEATING; RADIATOR.
- Weber, Prof. Harold Christian. *Professor of Chemical Engineering, Massachusetts Institute of Technology.* ENTHALPY; ENTROPY. HEAT CAPACITY, series of related articles
- Weckel, Dr. Kenneth Granville. *Department of Dairy and Food Industries, University of Wisconsin.* VITAMIN D (in part).
- Weeks, Lewis George. *Geological Consultant.* MINERAL FUEL AREAS.
- Weeks, Dr. Owen B. *Research Professor, New Mexico State University.* ACHROMOBACTERACEAE.
- Wehe, Herman G. *Bell Telephone Laboratories, Inc.* METAL COATINGS (in part).
- Wehr, Dr. Everett Elmer. *Principal Research Parasitologist, Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture.* FILARIDIOIDA.
- Weibel, Dr. Ewald Rudolf. *Associate Professor, Department of Anatomy, University of Zürich, Switzerland.* RESPIRATORY SYSTEM DISORDERS, articles on various respiratory disorders.
- Weichert, Prof. Charles Kipp. *Professor of Zoology and Dean, College of Arts and Sciences, University of Cincinnati.* CARDIOVASCULAR SYSTEM. REPRODUCTIVE SYSTEM. URINARY SYSTEM (all in part).
- Weil, Dr. Alfred Julius. *Attending Microbiologist, Bronx-Lebanon Hospital Center, New York.* Series of articles on enteric bacteria
- Weil, Prof. Robert T., Jr. *School of Engineering, Manhattan College.* DIRECT-CURRENT GENERATOR; MAGNETO.
- Weinman, Dr. David. *Associate Professor of Microbiology, Yale University.* PARASITOLOGY, MEDICAL; series of articles on parasitic infections
- Weinstein, Dr. Marvin Joseph. *Manager, Department of Microbiology, Schering Corporation.* GRISOFULVIN.
- Weisman, Prof. S. I. *Washington University.* ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY.
- Welch, Dr. Harold E. *Zoology Department, University of Manitoba, Canada.* Series of articles on taxonomic groups of nematodes
- Welch, Dr. Winona H. *Head, Department of Botany and Bacteriology, De Pauw University.* Series of taxonomic articles on mosses.
- Weller, Dr. J. Marvin. *Professor emeritus, Department of Geophysical Sciences, University of Chicago.* CYCLOTHEM, VARVE.
- Wellman, Dr. Frederick Lovejoy. *Visiting Professor, Tropical Plant Pathology, Department of Plant Pathology, North Carolina State University.* CACAO.
- Wellner, Daniel. *Department of Biochemistry, Tufts University School of Medicine.* ENZYME (in part).
- Wells, Prof. John W. *Department of Geology, Cornell University.* COELENTERATA FOSSILS; SCLERAUTINIA FOSSILS.
- Wells, Prof. Lemen J. *Professor of Anatomy, University of Minnesota.* REPRODUCTIVE SYSTEM (in part).

- Wendlandt, Dr. Wesley W. *Professor of Chemistry, Texas Technological College.* CARBON; CHEMICAL SYMBOLS AND FORMULAS; MANGANESE COMPOUNDS; other articles on inorganic chemistry.
- Wengerd, Dr. Sherman A. *Professor of Geology, University of New Mexico.* BIOHERM; BIOTROME; STROMATOLITE.
- Wenkert, Prof. Ernest. *Department of Chemistry, Indiana University.* STERIC EFFECT (CHEMICAL REACTION).
- Went, Dr. Frits Warmolt. *Professor of Botany, Desert Research Institute, University of Nevada.* PLANT GROWTH.
- Wentworth, John W. *Manager, CCSE Program, Radio Corporation of America.* TELEVISION RECEIVER (in part).
- Wenzel, Dr. William A. *Lawrence Radiation Laboratory.* SPACE CHAMBER.
- Werbin, I. Vernon. *Licensed Professional Engineer and Attorney* ENGINEERING AND ARCHITECTURAL CONTRACTS.
- West, Dr. William. *Eastman Kodak Company* ABSORPTION (ELECTROMAGNETIC RADIATION); DISPERSION (RADIATION).
- Wetmore, Dr. Alexander. *Research Associate, Smithsonian Institution.* ARCHAEORNITHES (in part); AVES FOSSILES; DIATRYMIFORMES; DINORNITHIFORMES; HENPERORNIS; ICTHYORNIS.
- Wever, Prof. Ernest Glen. *Department of Psychology, Princeton University* PHONORECEPTION.
- Wexler, Dr. Harry. *Former Director of Research, U.S. Weather Bureau.* POLAR METEOROLOGY.
- Wharton, Dr. G. W. *Chairman and Professor, Department of Zoology and Entomology, Ohio State University.* ACARINA.
- Wheeler, Prof. John Archibald. *Palmer Physical Laboratory, Princeton University.* ATOMIC BOMB CHAIN REACTION, NUCLEAR CRITICAL MASS; FISSION, NUCLEAR.
- Whinnery, Prof. John R. *Professor of Electrical Engineering, University of California, Berkeley.* BACKWARD-WAVE TUBE; KLYSTRON; MAGNETRON; MICROWAVE TUBE; TRAVELING-WAVE TUBE.
- Whistler, Prof. Roy Lester. *Department of Biochemistry, Purdue University.* Series of articles on carbohydrates and their derivatives (all co-authored).
- Whitcomb, Dr. Richard T. *Head, 8-Foot Wind Tunnels Branch, Langley Research Center, National Aeronautics and Space Administration.* AERODYNAMIC WAVE DRAG; TRANSONIC FLIGHT.
- White, Dr. C. Langdon. *Professor of Geography, Stanford University.* SOUTH AMERICA.
- White, Prof. Colin. *Department of Epidemiology and Public Health, Yale University School of Medicine.* EPIDEMIOLOGY, series of articles in epidemiology.
- White, Prof. D. C. *Massachusetts Institute of Technology, Department of Electrical Engineering.* THERMOELECTRIC POWER GENERATOR.
- White, Dr. T. A. *Technical Director for Foods, National Starch and Chemical Corporation.* STARCH.
- Whitehead, Prof. W. Dexter. *Department of Physics, University of Virginia.* MEAN FREE PATH.
- Whitney, Dr. Roy P. *Dean and Vice-President, Institute of Paper Chemistry.* PAPER AND PAPER PRODUCTS.
- Whittaker, Dr. Robert H. *Professor of Biology, University of California, Irvine.* BIOTIC ISOLATION; ECOSYSTEM; TERRITORIALITY.
- Whittington, Prof. Harry B. *Professor of Geology, Harvard University.* TRILOBITA.

- Widder, Prof. David Vernon. *Harvard University*. INTEGRAL TRANSFORM; LAPLACE TRANSFORM.
- Wiens, Prof. Herold J. *Department of Geography, Yale University*. ASIA.
- Wiesman, Clarence K. *Director, Research and Development Division, John Sexton and Company*. FOOD ENGINEERING; FOOD MANUFACTURING (both in part).
- Wightman, Prof. Arthur Strong. *Professor of Mathematical Physics, Princeton University*. GROUP THEORY.
- Wildhack, William A. *Associate Director, Institute for Basic Standards, National Bureau of Standards*. INSTRUMENTATION; PHYSICAL MEASUREMENT; VERNIER.
- Wilhelm, Dr. Harley A. *Associate Director, Institute for Atomic Research and Ames Laboratory of U.S. Atomic Energy Commission*. THORIUM; URANIUM METALLURGY.
- Wilke, Prof. Charles R. *Department of Chemical Engineering, University of California*. DIFFUSION IN GASES AND LIQUIDS; MASS-TRANSFER OPERATION.
- Wilkinson, Prof. Denys Haigh. *University of Oxford, England*. BINDING ENERGY, NUCLEAR (in part); NUCLEAR STRUCTURE; POTENTIAL BARRIER.
- Wilkinson, Dr. Michael K. *Research Physicist, Oak Ridge National Laboratory*. NEUTRON DIFFRACTION.
- Wilkinson, Roger I. *Head, Traffic Research Department, Bell Telephone Laboratories, Inc.* COMMUNICATIONS SYSTEM (TRAFFIC) DESIGN.
- Willott, Prof. H. G. *Department of Meteorology, Massachusetts Institute of Technology*. AIR MASS.
- Williams, Dr. Dean N. *Battelle Memorial Institute*. LEAD ALLOYS.
- Williams, Prof. Dudley. *Department of Physics, Kansas State University*. MEASURE; UNITS, SYSTEMS OF; series of articles on physics.
- Williams, Prof. Everard Mott. *Carnegie Institute of Technology*. COAXIAL CABLE.
- Wilson, Prof. E. Bright, Jr. *Department of Chemistry, Harvard University*. CHEMICAL BINDING.
- Wilson, Prof. J. Walter. *Department of Biology, Brown University*. LIVER (in part).
- Wilson, Dr. John Tuzo. *Director of Institute of Earth Sciences, University of Toronto, Canada*. TECTONOPHYSICS; WARPING, EARTH CRUST.
- Wilson, Dr. Leonard Richard. *Research Professor of Geology, University of Oklahoma; Geologist IV, Oklahoma Geological Survey*. PALYNOLOGY.
- Wilson, Dr. Morley E. *Geological Survey of Canada (retired)*. ARCHEOZOIC; BASEMENT ROCK; PRECAMBRIAN; PROTEROZOIC.
- Winch, Prof. Ralph P. *Barclay Jermain Professor of Natural Philosophy, Williams College*. CAPACITANCE; ELECTROSTATICS; MAGNET; other articles on electrostatics and magnetostatics.
- Winding, Dr. Charles C. *Director, School of Chemical Engineering, Cornell University*. PLASTICS FABRICATION.
- Winger, Dr. Alvin G. *Foreign Operations Division, Rohm and Haas Company*. NON-PERMEABLE MEMBRANE.
- Winkler, Dr. Eva M. *U.S. Naval Ordnance Laboratory*. SHOCK-WAVE DISPLAY.
- Winograd, Harold. *Consulting Engineer, Allis-Chalmers Manufacturing Company*. SEMICONDUCTOR RECTIFIER.
- Winterkorn, Dr. Hans F. *Professor of Civil Engineering, Princeton University*. SOIL MECHANICS.

- Wirry, Henry J. *Chief Application Engineer, Hydraulic Division, Twin Disc Clutch Company.* FLUID COUPLING; TORQUE CONVERTER.
- Wise, Edmund Merriman. *Assistant to Vice-President, Research, The International Nickel Company, Inc.* GOLD ALLOYS; SILVER ALLOYS.
- Wislicenus, Dr. George F. *Director, Garfield Thomas Water Tunnel, Ordnance Research Laboratory, Pennsylvania State University; Head, Department of Aeronautical Engineering, Pennsylvania State University.* WATER TUNNEL.
- Withington, Sidney. *Chief Electrical Engineer (retired), New York, New Haven and Hartford Railroad.* REPULSION MOTOR; UNIVERSAL MOTOR.
- Wolfe, Dr. Ralph Stoner. *Department of Microbiology, University of Illinois.* CAULOBACTERIACEAE; SIDEROCAPSACEAE.
- Wolferz, Alfred H. *Tachometer Development Director (retired), Weston Instruments.* TACHOMETER.
- Wolff, Bertram. (Formerly) *H. Wolff Book Manufacturing Company.* BOOK MANUFACTURE.
- Wonders, Dr. William C. *Professor and Head, Department of Geography, University of Alberta, Canada.* ARCTIC AND SUB-ARCTIC ISLANDS.
- Wood, Prof. Earl Howard. *Mayo Foundation, University of Minnesota and Mayo Clinic.* OXIMETRY.
- Wood, Dr. Ivan Daley. *Consulting Engineer.* IRRIGATION OF CROPS.
- Woodall, James E. *Division Manufacturing Manager, Lamp Division, Westinghouse Electric Corporation.* PILOT PRODUCTION.
- Woodbury, Dr. Angus M. *Professor emeritus, Ecological Research, University of Utah.* ANIMAL COMMUNITY.
- Woodcock, Alfred Herbert. *Oceanography and Meteorology, Institute of Physics, University of Hawaii, Honolulu.* SEA WATER (in part).
- Woodroof, Dr. Jasper Guy. *Chairman, Division Food Processing, University of Georgia.* PEANUT (in part); PECAN.
- Woods, Prof. John M. *School of Chemical Engineering, Purdue University.* ESTERIFICATION; TRANSESTERIFICATION.
- Woodson, Prof. Herbert H. *Department of Electrical Engineering, Massachusetts Institute of Technology.* MAGNETOHYDRODYNAMIC POWER GENERATOR.
- Wooley, Prof. John C. *Professor emeritus in Agricultural Engineering, University of Missouri.* AGRICULTURAL ENGINEERING (STRUCTURES).
- Wooster, Dr. Warren S. *Professor of Oceanography, Scripps Institution of Oceanography, University of California.* SEA WATER (in part).
- Worchel, Prof. Philip. *Professor of Psychology, University of Texas.* BLINDNESS.
- Work, Dr. Lincoln T. *Consulting Engineer.* SIZE REDUCTION.
- Worthington, Lawrence Valentine. *Woods Hole Oceanographic Institution.* CARIBBEAN SEA; SARGASSO SEA.
- Wright, Rear Adm. Edward Alvey. *Commander, Pearl Harbor Naval Shipyard, Hawaii.* WAKE (SEAGOING VESSELS).
- Wright, Elliott Francis. *Consulting Engineer, Advance Products Division, Worthington Corporation.* CENTRIFUGAL PUMP; DISPLACEMENT PUMP; PUMP; PUMPING MACHINERY.
- Wulff, Dr. Verner J. *Masonic Research Laboratory.* PHOTO-RECEPTION (in part).
- Wyrski, Dr. Klaus. *Professor of Oceanography, University of Hawaii.* SOUTHEAST ASIAN WATERS.

## Y

Yamada, Dr. Prof. Tuneo. *Biology Division, Oak Ridge National Laboratory*. EMBRYONIC INDUCTION; EMBRYONIC ORGANIZER; FATE MAPS, EMBRYONIC.

Yeatman, Dr. Harry C. *Professor of Biology, University of the South*. CYCLOPOIDA.

Yntema, Dr. George Busey. *United Aircraft Research Laboratories*. MEISSNER EFFECT; SUPERCONDUCTIVITY.

Yochelson, Dr. Ellus Leon. *U.S. Geological Survey*. CONICONCHIA; CONULARIDA; GASTROPODA FOSSILS; MONOPLACOPHORA.

Yoke, Dr. John Thomas, III. *Department of Chemistry, Oregon State University*. SOAP AND DETERGENT.

Yosim, Dr. Samuel J. *Group Leader, Physical Chemistry, Atomic International, Division of North American Aviation*. BISMUTH.

Yost, Prof. Don C. M. L. *Professor of Inorganic Chemistry, California Institute of Technology*. QUATERNIONS.

Young, Dr. David A. *Department of Entomology, North Carolina State University*. HOMOPTERA.

Young, Edward M., Jr. *Associate Editor, 'Engineering News-Record'*. Series of articles on earth-moving machinery.

Young, Dr. James R. *Mead Johnson Research Center*. GUM (in part).

Young, Prof. Paul Thomas. *Professor emeritus, Department of Psychology, University of Illinois*. MOTIVATION.

Young, Dr. Robert William. *Consultant in Acoustics, U.S. Navy Electronics Laboratory*. MUSICAL ACOUSTICS, MUSICAL INSTRUMENTS; series of related articles.

Young, Dr. Roland S. *Consulting Chemical Engineer, Canada*. COBALT.

Young, Dr. Thomas Fraser. *Professor of Chemistry, University of Chicago*. EQUILIBRIUM, IONIC, HYDROLYSIS, series of related articles.

Yu, Dr. Ching-Sung. *Professor of Astronomy, Hood College; Director, Williams Observatory*. CONSTELLATIONS, articles on various constellations.

## Z

Zabin, Irving. *Professor, Department of Biological Chemistry, University of California School of Medicine*. CHOLESTEROL; ERGOSTEROL; STEROID (in part); STEROL.

Zacharias, Dr. Jerrold Reinach. *Professor of Physics, Massachusetts Institute of Technology*. ATOMIC CLOCK.

Zangerl, Dr. Rainer. *Chief Curator, Department of Geology, Chicago Natural History Museum*. EURYAPSIDA; PROTOSAURIA; SAUROPTERYGIA.

Zaunmeyer, Dr. William John. *Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture*. BEAN (in part).

Ziemba, John V. *Midwest Editor, 'Food Engineering'*. FOOD ENGINEERING (in part).

Zimmerman, Prof. Arnold A. *Department of Anatomy, Baylor College of Medicine, Texas Medical Center*. LYMPHATIC SYSTEM (in part).

Zinder, Dr. Norton D. *Rockefeller Institute*. TRANSDUCTION, BACTERIAL.

Zirkle, Prof. Raymond E. *Professor of Biophysics, University of Chicago*. LINEAR ENERGY TRANSFER (BIOLOGY).

Zuk, Dr. William. *University of Virginia*. CRFEP OF MATERIALS; PHOTOELASTICITY.

Zweifel, Dr. Richard George. *Curator, Department of Herpetology, American Museum of Natural History*. AMPHIBIA; series of articles on related taxonomic groups.

Zwilling, Prof. Edgar. *Brandeis University*. TERATOGENESIS.



## How to Use the Index

The purpose of the index is to help the user find specific information. To this end, an index entry has been made for every term discussed in the encyclopedia.

Entries are specific rather than general. The entries under "Chemistry" and "Chemical engineering" refer to the subject as a whole. Specific chemical compounds, elements, and processes related to chemistry or chemical engineering are indexed under their own names, often with analytical subentries or cross references to related subjects.

In general, an index entry is a scientific or technological term rather than a common synonym—for example, "Phototube" rather than "Electric eye"; "*Drosophila melanogaster*" rather than "Fruit fly."

The spelled-out form rather than an abbreviation is used for an entry. There are cross references from common abbreviations—for example, "AC" *see* "Alternating current" and "DNA" *see* "Deoxyribonucleic acid."

In chemical compounds with prefixes, the prefixes are disregarded: *N*-benzoylglycine is under "Benzoylglycine" and beta-sulfur under "Sulfur."

The alphabetical arrangement is library style, word by word, rather than dictionary style, in which the division of words is disregarded. Hyphenated words are arranged as separate words, so that "Direct-current ammeter" immediately follows "Direct current."

Volume numbers are given in boldface, followed by page numbers referred to in that volume. Thus "4 48-50; 12 136-140" indicates pages in volumes 4 and 12. Where an entry is also an article title, and there is more than one page citation, an asterisk has been placed after the one for the page on which the article title will be found, to help the reader find the major discussion of certain indexed topics. Thus if 12 151, 161-161\* are the page citations, the article title and hence major discussion will be found on pages 161-164.

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# *Topical Index*



# *Explanation*

The topical index that follows groups the 7,360 articles in the Encyclopedia under about a hundred general headings. These listings give some indication of the great fund of information to be found in the more than 9,000 pages of the Encyclopedia. They will enable the interested reader to find quickly the articles in an area of science or technology in which he is seeking knowledge. For example, he will find titles of articles dealing with astronomy listed under the heading Astronomy, of articles dealing with microbiology under Microbiology, and so on.

The listings will be found to be useful in many ways. They will assist the reader who desires a thorough grounding in any subject covered in the Encyclopedia. If he is interested in acoustics, for example, he can turn to the list under that heading. Then, by studying all the articles listed there, he can significantly increase his knowledge of the subject. The Encyclopedia offers a broader and more up to date coverage of many scientific and technological subjects than will be found in most textbooks.

The listings will help the student engaged in research by providing further information on some aspect of a subject. It will be easy for him to find the articles related to his research activities by simply selecting the pertinent titles given under the general heading.

For a considerably more detailed listing, which goes well beyond article titles, the reader should refer to the 100,000-entry analytical index which makes up most of Volume 15. The analytical index entries are specific, rather than general as in the topical index.

Actually, there are five approaches by which the student can find information in the encyclopedia:

1. The alphabetical placement by title of articles in the Encyclopedia.
2. The comprehensive index.
3. The topical index.
4. The 40,000 cross references among articles.
5. The list of contributors in Volume 15 which shows the major articles written by each contributor.

## **Using the listings**

The listings can be used in various ways, depending on one's goal. A reader seeking information on a general subject, for example, might not be interested in all of the articles in a list. There are approximately 100 articles listed under Meteorology and climatology. Some of these, such as Air glow, Backing wind, and Millibar, are essentially only concise descriptions or they may cover some specific aspect of a larger subject. On the other hand, such articles as Air pressure, Meteorological instrumentation, and Weather (forecasting and prediction) deal with

fundamentals or more general aspects. Thus, the reader has various choices. If he is interested in all aspects of a subject, he can read all of the articles listed under that subject heading. He can then go to the lists under the headings cited in the cross references, and select from these lists the articles related to his basic area of interest.

As an alternative, the reader can select from the list only those articles dealing with the general aspects of the subject and pass up the short, descriptive articles or those on specific topics. For example, a large number of the several hundred articles listed under Geology (mineralogy and petrology) are concerned with specific minerals and rocks. The selective reader might pass by these to concentrate on the more general articles such as Clay minerals, Igneous rocks, Magma, Metamorphic rocks, Sedimentary rocks, and so on. Here, too, the reader should refer to the other subject headings cited at the end of the Geology (mineralogy and petrology) list in order to locate related articles that are classified for the purpose of the topical index in other areas.

Undue repetition of article titles among several lists was avoided by not placing *all* related articles under each heading. For example, the titles of the many crystal articles, listed under Solid-state physics, would have to be repeated under Geology (mineralogy and petrology) to make that list complete. To avoid this repetition, a cross reference at the end of Geology (mineralogy and petrology) states: "For additional treatment of crystalline materials see SOLID-STATE PHYSICS." Most of the lists carry similar references.

## Acoustics

Absorption (sound). Acoustic mine. Acoustic torpedo. Acoustics. Aircraft noise. Anechoic chamber. Architectural acoustics. Audio. Audio amplifier. Audiometry. Beat. Bel. Binaural sound. Crossover network. Deafness. Decibel. Directivity. Disk recording. Doppler effect. Ear protectors. Echo. Echo sounder. Electroacoustics. Equalization. Frequency-response. Fidelity. Filter, acoustic. Fletcher-Munson contours. Flutter and wow. Free field. Hearing. Hearing aid. High fidelity. Hydrophone. Hypersonics. Image. Acoustical Impedance, acoustic. Interference of waves. Interferometer, acoustic. Inverse square law. Loudness. Loudspeaker. Magnetic recording. Masking (sound). Megaphone. Microbar. Microphone. Microphonics. Muffler. Musical acoustics. Musical instruments. Noise, acoustic. Noise control. Noise control in buildings. Noise measurement. Octave. Optical recording. Overtone (music and acoustics). Partial tone. Phon. Phonetics. Phonograph. Physiological acoustics. Point source. Psychoacoustics. Public address system. Radiometer, acoustic. Recording. Reflection (sound). Reflection and transmission coefficients. Refraction of waves. Resonance (acoustics and mechanics). Resonator, acoustic. Reverberation. Scale (music). Silencer. Siren (acoustics). SOFAR. Sonar. Sone. Sonics. Sonobuoy. Sound. Sound intensity. Sound pressure. Sound recording. Sound reproduction systems, electrical. Sound track. Soundproofing. Stereophonic sound. Tone (music and acoustics). Transducer, underwater. Tuning fork. Ultrasonics. Underwater sound. Underwater telephone. Vocoder. Volume unit (VIU). Wire recording.

For articles on wave motion and vibration *see* CLASSICAL MECHANICS. For transmission of sound by modulated carrier waves over electric circuits or radio waves *see* COMMUNICATIONS. For the physiology of hearing *see* COMPARATIVE PHYSIOLOGY.

## Aeronautical engineering

Adhesive, structural. Aerodynamic center. Aerodynamic force. Aerodynamic wave drag. Aerodynamics. Aeroelasticity. Aeromechanics. Aeronautical engineering. Aeronautics. Aerostat. Aerostatics. Aerothermodynamics. Afterburner. Air navigation.

Air pocket. Air traffic control. Air transportation. Aircraft. Aircraft, military. Aircraft compass system. Aircraft engine. Aircraft engine, reciprocating. Aircraft engine performance. Aircraft fuel. Aircraft instrument panel. Aircraft instrumentation. Aircraft low-approach system (ILS). Aircraft noise. Aircraft propulsion. Aircraft testing. Air-cushion vehicle. Airfoil. Airfoil profile. Airframe. Airplane. Airport engineering. Airport surface detection equipment. Airship. Air-speed indicator. Air-velocity measurement. Altimeter, pressure. Altimeter, radio. Aluminum. Anemometer. Armament, air. Aspect ratio. Autogiro. Automatic astronavigation. Automatic horizon. Automatic landing system. Autopilot. Aviation. Balloon. Blimp. Borane. Boron fuel. Center of gravity. Ceramic technology. Chemical fuel. Compass, radio. Convertiplane. Diffuser. Dirigible. Drone. Dynamic similarity. Elevator, aircraft. Fire detector. Flight. Flight characteristics. Flight controls. Flight dynamics. Flight science. Flutter, aeronautical. Fuel. Fuselage. Gas dynamics. Glide-path indicator. Glider. Guided missile. Helicopter. Hypersonic flight. Instrument landing system. Jet flow. Jet fuel. Jet propulsion. Jet velocity. Kerosene. Kite. Landing gear. Mach number. Magnesium. Metal-base fuel. Missile. Model theory. Nozzle. Nuclear aircraft propulsion. Nuclear rocket. Optical tracking instruments. Ornithopter. Parachute. Pitot tube. Propellant. Propeller, air. Propulsion. Pulse jet. Ram jet. Rate-of-climb indicator. Reentry. Refractory. Rocket. Rocket engine. Rocket-sled testing. Rudder, aircraft. Runway, airport.

Sailplane. Seaplane. Similitude. Skin friction. Sonic barrier. Sonic boom. Specific fuel consumption. Specific impulse. Stabilizer. Stall-warning indicator. Strain gage. Streamline flow. Streamlining. Subsonic flight. Superaerodynamics. Supercharger. Supersonic diffuser. Supersonic flight. Tail assembly. Thermal stress. Throttled flow. Thrust. Transonic flight. Turbine propulsion. Turbofan. Turbojet. Turboprop. Turboram jet. Turbulent flow. Turn and bank indicator. Vertical take-off and landing. Wind tunnel. Wind tunnel instrumentation. Wing. Wing loading. Wing structure. Yaw indicator.

For theoretical aspects of air flow phenomena *see* FLUID MECHANICS. For articles on propulsion methods, devices, and fuels *see* PROPULSION. For

aircraft armament and further articles on missile technology *see* **ARMAMENT**; **SPACE TECHNOLOGY**. For further aspects of structural design *see* **ENGINEERING MECHANICS**. For information on control systems and instrumentation *see* **COMMUNICATIONS**; **CONTROL SYSTEMS ENGINEERING**; **NAVIGATION**.

## **Agriculture**

Agricultural chemistry. Agricultural engineering. Agricultural machinery. Agricultural meteorology. Agricultural science (animal). Agricultural science (plant). Agricultural soil and crop practices. Agriculture. Agriculture (drainage). Agriculture (structures). Agronomy. Alfalfa. Almond. Animal-feed composition. Annual plants. Apple. Apricot. Artichoke. Asparagus. Avocado. Banana. Barley. Bean. Bee and beekeeping. Beet. Bermuda grass. Biennial plants. Blackberry. Blueberry. Bluegrass. Bluestem grass. Brazil nut. Breeding (animal). Breeding (plant). Broccoli. Brome grass. Brussels sprouts. Buckwheat. Butlap. Butter. Cabbage. Cacao. Camel's hair. Cantaloupe. Canvas. Carnauba. Carrot. Cashew. Cashmere. Cattle production, beef. Cattle production, dairy. Cauliflower. Celery. Cereal. Cheese. Chemurgy. Cherry. Chicory. Citron. Coconut. Coffee. Coir. Collard. Corn. Cotton. Cover crops. Cowpea. Crabapple. Cranberry. Cress. Cucumber. Currant. Dairy machinery. Dallis grass. Date. Deciduous plants. Defoliant. Drought. Egg (fowl). Eggplant. English walnut. Farm crops. Fertilizer. Fertilizing. Fescue. Fiber crops. Fig. Filbert. Flax. Floriculture. Forestry, farm. Frost. Fruit (tree). Fruit growing (small). Fumigant.

Garlic. Gibberellin. Goat. Gooseberry. Grain crops. Grape culture. Grapefruit. Grass crops. Growing season. Hemp. Herbicide. Honey Dew melon. Hop. Horse production. Horseradish. Horticultural crops. Insect control, biological. Insecticide. Irrigation of crops. Kale. Kohlrabi. Kudzu. Kumquat. Landscape architecture. Legume forages. Lemon. Lespedeza. Lettuce. Lime (botanical). Lupine. Mandarin. Melon growing. Milk. Millet. Miti-cide. Mohair. Mule production. Muskmelon. Mustard. Nectarine. Nematocide. Nut crop culture. Oats. Okra. Olive. Onion. Orange. Ornamental plants. Paprika. Parsley. Parsnip. Pea. Peach. Peanut. Pear. Pecan. Pedology. Pepper. Perennial plants. Persian melon. Pimento. Pineapple. Pistachio. Plant disease. Plant physiology. Plum. Poisonous plants. Pomegranate. Potato. Irish. Potato, sweet. Poultry production. Pumpkin. Quince. Radish. Rape. Raspberry. Redtop grass. Rodenticide. Rhubarb. Rice. Rural electrification. Rural sanitation. Rust (microbiology). Rutabaga. Rye. Sheep. Silk. Smut (microbiology). Soil. Soil (great soil groups). Soil mechanics. Soil sterilization. Sorghum. Soybean. Spinach. Squash. Strawberry. Sugar beet. Sugar cane. Sugar crops. Sunflower. Swine production. Tangerine. Terracing (agricultural). Timothy. Tobacco. Tomato. Tractor. Tur-

nip. Vegetable growing. Vetch. Watermelon. Wheat. Wool.

For such aspects of agriculture as wildlife management, farm fish ponds, land range management *see* **CONSERVATION**. For more information on the physiological processes *see* **PLANT PHYSIOLOGY**.

## **Air conditioning, heating, and ventilation**

*See* **MECHANICAL ENGINEERING**.

## **Analytical chemistry**

Activation analysis. Analytical chemistry. Analytical chemistry, errors in. Archeological chemistry. Assaying. Balance (analytical). Balance (weighing instrument). Buret. Camera. Chemical microscopy. Chemical dating. Chromatography. Colorimetric analysis. Colorimetry. Coulometric analysis. Electrodeposition analysis. Extraction. Flame photometry. Flocculation. Fluorimetric analysis. Forensic chemistry. Gas analysis. Gas chromatography. Gravimetric analysis. Indicator, acid-base. Infrared spectroscopy. Interferometry. Ion exchange. Line spectrum. Mass spectroscope. Microscope. Nephelometric analysis. Nucleation. Optical methods of chemical analysis. Organic quantitative analysis. Photometry. Pipet. Polarimetric analysis. Polarized light. Polarographic analysis. Precipitation (chemistry). Qualitative chemical analysis. Quantitative chemical analysis. Radioactivity (applications). Radioisotope (assay). Radiometric assay. Raman effect. Reagent chemicals. Refractometric analysis. Sampling techniques. Separation (chemical and physical). Solubilizing of samples. Spectrochemical analysis. Spectrography. Spectrophotometric analysis. Spectroscopy. Spectroscopy of combustion. Spot-test analysis. Stoichiometry. Supersaturation. Thermoanalysis. Titration. Titration amperometric. Titration, conductimetric. Titration, potentiometric. Trace analysis. Turbidimetric analysis. Units, systems of. Vacuum fusion. Volatilization. Volumetric analysis. Volumetric flask. Weight. Weight measurement. X-ray crystallography. X-ray diffraction. X-ray fluorescence analysis. X-ray optics. X-ray powder methods.

For the application of quantitative measurement and analysis in fields of science and technology *see* **ATOMIC PHYSICS**; **CHEMICAL ENGINEERING**; **GEOLOGY (MINERALOGY AND PETROLOGY)**; **INORGANIC CHEMISTRY**; **METALLURGICAL ENGINEERING**; **ORGANIC CHEMISTRY**; **PHYSICAL CHEMISTRY**.

## **Anatomy**

*See* **ANIMAL ANATOMY**; **INVERTEBRATE ZOOLOGY**; **PALEOBOTANY**; **PALEONTOLOGY**; **PLANT ANATOMY**; **VERTEBRATE ZOOLOGY**.

## **Animal anatomy**

Abdomen. Adrenal gland. Anatomy, regional. Ankle. Anus. Aorta. Appendix. Arm. Artery. Autonomic nervous system. Blood vessels. Bone. Brain. Breast. Bronchus. Bursa. Capillary (ana-

tomical). Cardiovascular system. Central nervous system. Circulatory system. Collarbone. Colon. Copulatory organ. Cowper's gland. Cranial nerve. Cranium. Dentition. Digestive system. Ear. Endocrine system. Esophagus. Eye. Fallopian tube. Foot. Gallbladder. Ganglion. Gastrointestinal tract. Gill (anatomy). Hand. Head. Heart. Hip. Intestine. Joint (anatomical). Larynx. Leg. Ligament. Liver. Lung. Lymph node. Lymphatic system. Meninges. Mouth. Muscular system. Neck. Nervous system. Neuron. Nose. Ovary. Pancreas. Parasympathetic nervous system. Parathyroid gland. Pelvis. Penis. Peritoneum. Pharynx. Pineal body. Pituitary gland. Prostate gland. Rectum. Reproductive system. Respiratory system. Reticular formation (brain). Sense organ. Shoulder. Sinus. Skeletal system. Skin. Skull. Spinal cord. Spine. Stomach. Spleen. Sympathetic nervous system. Tendon. Thigh. Thyroid gland. Throat. Tongue. Tonsil. Trunk. Urinary bladder. Urinary system. Urogenital system. Uterus. Vagina. Vein. Vertebra. Vocal cords. Wrist.

See also ANIMAL PATHOLOGY; GROWTH AND MORPHOGENESIS; HISTOLOGY; INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

## Animal behavior

See ANIMAL ECOLOGY; PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

## Animal ecology

Animal community. Biogeography. Biological productivity. Biomass. Community classification. Deep-sea fauna. Ecologic interactions. Ecological systems. energy in. Ecology. Ecology, applied. Ecology, human. Ecosystem. Environment. Food chain. Freshwater ecosystem. Limnology. Marine biological sampling. Marine ecosystem. Phoresy. Plant community. Population dynamics. Protective coloration. Pyramid of numbers. Sea water fertility. Social animals. Social hierarchy. Social insects. Space biology. Species population. Succession, ecological. Terrestrial ecosystem. Zoogeographic region. Zoogeography.

For ecological aspects concerned with wildlife management see CONSERVATION; for animal distribution in time see EVOLUTION; for functional and behavioral aspects see GENERAL PHYSIOLOGY; PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL. For invertebrate animals see INVERTEBRATE ZOOLOGY; for physical and biotic aspects see PHYSICAL GEOGRAPHY; for other animal groups see VERTEBRATE ZOOLOGY.

## Animal pathology

Ablastin. Abnormal behavior. Achondroplasia. Acne. Actinomycosis. Actinophage. Addison's disease. Adenovirus. Adrenal disorders. Aerobacter. Agamma-globulinemia. Agglutination reaction. Agglutinin. Agnosia. Allergy. atopic. Amebiasis. para-Aminobenzoic acid. Amnesia. Analgesics. Anaphylaxis. Anaplasia. Anemia. Anesthetic. An-

eurysms. Angina pectoris. Animal virus. Anoxia. Anthrax. Antibody. Antigen. Antigen-antibody reaction. Antihistamines. Antitoxin. Aphasia. Appendicitis. Apraxia. Arbor viral encephalitis. Arthritis. Arthus reaction. Ascariasis. Aspergillosis. Asthma. Atrophy. Avian leukosis. Bacillary dysentery. Bacteria. lysogenic. Bacteriology, medical. Bacteriophage. Balantidiasis. Barbiturates. Bejel. Benzadrine. Beriberi. Biological specificity. Biologicals. Birthmark. Blackleg. Blastomycosis. Blindness. Blood groups. Blood-plate hemolysis. Botulism. Breast disorders. Bronchial disorders. Bronchiectasis. Brucellosis. Buerger's disease. Burn. Bursitis. Cachexia. Cancer (biology). Candidiasis. Carbuncle. Cardiovascular system disorders. Carrion's disease. Cat scratch disease. Cataract. Cathartics. Cerebral palsy. Chagas' disease. Chickenpox and shingles. Cholera vibrio. Chromomycosis. Circulation disorders. Cirrhosis. Clinical pathology. Clonorchiasis. Coccidioidomycosis. Coliphage. Colitis. Complement (serum). Complement-fixation test. Concussion. Conglutination. Conjunctivitis. Constipation. Convulsive disorders. Coxsackie virus. Cretinism. Cryptococcosis. Culture. Culture, embryonated egg. Culture, tissue. Cystitis. Deafness. Death. Delusion. Dengue fever. Dentistry. Dermatitis. Dermatophytosis. Diabetes. Diarrhea. Diphtheria. Disease. Disease carrier. Drug resistance. Dyschondroplasia. ECHO virus. Eczema. Edema. Effective dose 50. Embolism. Embolus. Encephalitis, equine. Endocarditis. Enteric bacilli. Enterovirus. Epidemic. Epidemiology. Epilepsy. Escherichia. Esophagus, disorders of. Exanthem subitum. Eye disorders. Eye glasses.

Fascioliasis. Fasciolopsiasis. Fever. Fièvre boutonneuse. Filariasis. Foot and mouth disease. Forensic medicine. Fungistat and fungicide. Gaffkya tetragena. Gallbladder disorders. Gallstones. Gangrene. Gangrene gas. Gastrointestinal tract disorders. Germ. German measles. Germfree vertebrate. Gerontology. Glanders. Glaucoma. Goiter. Gonorrhea. Gout. Gram-negative diplococci. Granuloma inguinale. Guinea worm infection. Hallucination. Harelip. Hay fever. Headache. Heart disorders. Heartwater disease. Hemadsorption viruses. Hematologic disorders. Hemophilia. Hemophilic bacteria. Hemorrhage. Hemorrhagic septicemia. Hemorrhoids. Hepatitis. Hermaphroditism. Hernia. Herpes simplex. Heterophile antigen. Heterophyiasis. Histamine. Histoplasmosis. Hodgkin's disease. Hookworm disease. Huntington's chorea. Hyaluronidase. Hyperplasia. Hypersensitivity. Hypertension. Hypertrophy. Hypnotic. Hypoplasia. Ileitis. Immunity. Immunologic tolerance, acquired. Immunology. Impetigo. IMViC test. Inclusion blennorrhoea. Inclusion bodies (virus). Infant diarrhea. Infarction. Infection. Infection, lytic. Infectious disease control. Infectious disease transmission. Infectious mononucleosis. Infective dose 50. Inflammation. Influenza. Inoculation. Insect pathology. Interferon. Intestine, disorders of. Iso-

antigen. Isonicotinic acid hydrazide. Jaundice. Johne's disease. Keratitis. Keratoconjunctivitis (epidemic). Ketosis. Kidney disorders. Klebsiella pneumoniae. Lancefield differentiation scheme. Larynx disorders. Leishmaniasis. Leprosy. Leptospira. Lethal dose 50. Leukemia. Leukocidin. Leukopenia. Listeriosis. Liver disorders. Louping-ill. Lung disorders. Lupus erythematosus. Lymphocytic choriomeningitis. Lymphogranuloma venereum. Lymphogranuloma-pittacosis group. Lysin. Lytic reaction. Malaria. Malnutrition. Manic depressive psychosis. Mastitis. Measles. Medicine. Melioidosis. Meningitis. Meningococcus. Menopause. Mental illness. Metabolic disorders. Metaplasia. Mole (skin). Molluscum contagiosum. Mongoloid idiocy. Moraxella lacunata. Mouse viral leukemias. Mouth disorders. Multiple sclerosis. Mumps. Muscular dystrophy. Muscular system disorders. Mycology. medical. Myxomatosis, infectious (rabbits). Myxovirus.

Narcotic. Neoplasia. Nephritis. Nervous system disorders. Neuromyasthenia, epidemic. Neutralization reaction (antibody). Neutralizing antibody. Newcastle disease. Nitrofurantoin. Nocardiosis. Nose disorders. Nursing. Obesity. Obsessive compulsive reaction. Oncology. Opiates. Opsonin. Osteomyelitis. Pain, cutaneous. Pain, deep. Pancreas disorders. Papillomatosis, infectious (rabbit). Paracolon bacilli. Paragonimiasis. Parainfluenza. Paralysis agitans. Paranoia. Paranoid state. Parapertussis. Parasitology, medical. Paratyphoid fever. Paratyphoid gastroenteritis. Paresis, general. Parkinson's disease. Pathogen. Pathology. Pellagra. Peptic ulcer. Peritonitis. Phagocytosis. Pharmaceutical testing. Pharmacology. Pharmacy. Pharynx disorders. Phenylpyruvic oligophrenia. Phlebitis. Phlebotomus fever. Phobic reaction. Pigmentation. Pink eye. Pinta. Pinworm infection. Pituitary gland disorders. Plague. Pleuropneumonia-like organism (PPLo). Pneumococcus. Pneumocystosis. Pneumonia. Pneumonitis. Poison. Poliomyelitis. Precipitin. Precipitin test. Pregnancy. Pregnancy, disorders of. Properdin. Prostate disorders. Proteus. Pseudomonas aeruginosa. Pseudotuberculosis. Psittacosis. Psoriasis. Psychosis. Public health. Pyorrhea.

Q fever. Quellung reaction. Rabies. Ratbite fever. Relapsing fever. Reproductive system disorders. Respiratory system disorders. Retinitis. Rheumatic fever. Rheumatism. Rickets. Rickettsialpox. Rickettsiosis. Rous sarcoma. Salivary gland virus disease. Salmonella. Scarlet fever. Schistosomiasis. Schizophrenia. Sciatica. Scurvy. Sedation. Senescence. Senile dementia. Septicemia. Serology. Shigella. Shock syndrome. Sinusitis. Skeletal system disorders. Skin disorders. Skin test. Sleeping sickness. African. Smallpox. Soft chancre. Spinal cord disorders. Spirochete. Spleen disorders. Sporotrichosis. Spotted fever. Rocky Mountain. Spotted fever group. Staphylococcus. Sterility. Stomach disorders. Streptococcus. Strongyloidiasis. Sty. Sulfa drugs. Sulfone (anti-

microbial use). Surgery. Syphilis. Tapeworm disease. Tetanus. Thiosemicarbazone. Thrombosis. Thyroid gland disorders. Tick bite fever. South African. Tick fever. Colorado. Tick paralysis. Tick typhus. North Queensland. Tick typhus. Siberian. Tonsillitis. Tooth disorders. Tophus. Toxemia. Toxicology. Toxin, bacterial. Toxin-antitoxin reaction. Toxoplasmosis. Trachoma. Transfusion. Trauma. Trench fever. Trichinosis. Trichomoniasis. Tuberculosis. Tularemia. Tumor. Tumor viruses. Typhoid fever. Typhus, scrub. Typhus fever, endemic (flea-borne). Typhus fever, epidemic (louse-borne). Ulcer. Urinalysis. Urinary bladder disorders. Uterine disorders. Vaccination. Vaginal disorders. Venereal disease. Vincent's angina. Viral gastroenteritis, epidemic. Virulence. Virus. Virus chemoprophylaxis. Virus infection, latent. Virus interference. Wart. Weil's disease. West Nile fever. Whipworm disease. Whooping cough. Yaws. Yellow fever. Zoonoses.

## **Animal systematics**

Animal kingdom. Animal systematics. Species concept. Taxonomic categories. Type method. Zoological nomenclature.

For specific animal groups *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

## **Anthropology**

Animal evolution. Anthropology, physical. Anthropometry. Anthroposcopy. Archeological chemistry. Archeology. Chemical dating. Cro-Magnon man. Evolution, organic. Fontéchevade man. Fossil man. Heidelberg man. Java man. Life, origin of. Neanderthal man. Peking man. Piltdown man. Pleistocene. Primates (fossil). Recent. Rhodesian man. Solo man. Speciation. Steinheim man. Swanscombe man. Ternifine man.

*See also* PALEONTOLOGY.

## **Archeology**

*See* ANTHROPOLOGY.

## **Architectural engineering**

*See* CIVIL ENGINEERING.

## **Armament**

Acoustic mine. Acoustic torpedo. Aeronautical engineering. Airborne radar. Aircraft. Aircraft, military. Airplane. Airship. Antisubmarine warfare. Armament, air. Armament, army. Armament, naval. Atomic bomb. Ballistic missile. Ballistic range. Ballistics, exterior. Ballistics, interior. Balloon. Blimp. Chemical fuel. Chemical warfare. Combustion. Continuous-wave radar. Detonator. Dirigible. Doppler radar. Electronic countermeasures. Explosion and explosive. Fire. Fire-control systems. Fuel. Fulminate. Fuse, explosive. Gas mask. Guidance systems. Guided missile. Hydrogen bomb. Incendiary. Inertial guidance system. Jamming. Jet propulsion. Launching pad complex. Missile. Missile guidance systems. Monopulse radar. Moving-target indication. Nuclear explosion.



Passive radar. Picric acid. Primer (explosive). Propellant. Propulsion. Pulse jet. Pyrotechnics. Radar. Ram jet. Refractory. Rocket. Rocket staging. Screening smoke. Shaped charge. Ship, naval. Smoke. Sonar. Sonobuoy. Submarine. Supersonic flight. Trajectory. Underwater demolition.

For aircraft information see AERONAUTICAL ENGINEERING.

## Astronomy

Aberration of light. Albedo. Aldebaran. Alpha Centauri. Andromeda nebula. Antares. Antarctic Circle. Aphelion. Apogee. Apsides. Aquarius. Arctic Circle. Arcturus. Areal velocity. Aries. Asteroid. Astrometry. Astronomical coordinate systems. Astronomical geophysics. Astronomical instruments. Astronomical photography. Astronomical spectroscopy. Astronomical unit. Astronomy. Astrophysics. Atmosphere, geochemistry of. Atomic clock. Betelgeuse. Binary stars. Boötes. Calendar. Camera. Cancer (constellation). Capricornus. Carbon star. Cardinal points. Cassiopeia. Celestial mechanics. Celestial navigation. Celestial sphere. Centaurus. Center of mass. Central force. Centripetal force. Ceres. Chromosphere. Chronograph. Chronometer. Chronoscope. Clock. Coal sack. Comet. Constellation. Corona, solar. Coronagraph. Cosmic electrodynamics. Cosmic rays. Cosmochemistry. Cosmogony. Cosmology. Crab Nebula. Crux. Cygnus. Day. Doppler effect. Dwarf star. Earth (orbital motion). Earth tide. Eclipse, astronomical. Ecliptic. Einstein shift. Elements (cosmic abundance). Elements and nuclides (origin). Encke's comet. Ephemeris. Equator. Equinox. Eros. Escape velocity. Flying saucers. Galaxy, external. Galaxy, the. Gemini. Geography, mathematical. Giant star. Gravitation. Gravity.

Halley's comet. Horizon. Horology. Hydres. Interstellar matter. Interstellar space. Jupiter. Latitude, astronomical. Leo. Libra. Light-year. Longitude, astronomical. Lyra. Magellanic clouds. Magnitude, stellar. Mars. Mercury (planet). Meridian. Messier number. Metagalaxy. Meteor. Meteorite. Midnight sun. Mira. Mizar. Month. Moon. Nautical Almanac. Nebula. Nebulae, gaseous. Neptune. Nova. Nutation (astronomy and mechanics). Observatory, astronomical. Occultation. Orbital motion. Orion. Orion Nebula. Parallax (astronomy). Parsec. Pegasus. Perigee. Perihelion. Perseus. Perturbation (astronomy). Phase (astronomy). Photosphere. Pisces (constellation). Planet. Planetarium. Pleiades. Pluto. Polaris. Precession. Precession of equinoxes. Procyon. Proton-proton chain. Quartz clock.

Radiation. Radio astronomy. Radio sources (astronomy). Radio telescope. Red dwarf star. Red shift. Retrograde motion (astronomy). Rigel. Rocket astronomy. Sagittarius. Satellite (astronomy). Saturn. Schmidt camera. Scorpius. Second (time unit). Shadow. Sirius. Solar constant. Solar radiation. Solar system. Solstice. Space. Spectrochemical analysis. Spectroheliograph. Spica. Star.

Star cloud. Star clusters. Stellar evolution. Stellar magnetic field. Subgiant star. Sun. Sundial. Sunspot. Supergiant star. Supernova. Taurus. Telescope, astronomical. Tide. Time. Time-interval measurement. Transit (astronomy). Trojan planets. Tropic of Cancer. Tropic of Capricorn. Twilight. Twinkling stars. Umbra. Universe. Uranus. Ursa Major. Ursa Minor. Van Allen radiation. Variable star. Vega. Venus. Virgo. Watch. White dwarf star. Wolf-Rayet star. Year. Zenith. Zodiac. Zodiacal light.

For articles on space flight and vehicles see SPACE TECHNOLOGY. For celestial navigation see NAVIGATION. For articles on the upper atmosphere see GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY. For further articles on matter-energy relationships in cosmic applications see ATOMIC PHYSICS; ELECTROMAGNETIC RADIATION; NUCLEAR PHYSICS. For relativistic and other theoretical considerations regarding the nature of the universe see THEORETICAL PHYSICS.

## Atomic physics

Absorption. Absorption (electromagnetic radiation). Acceptor atom. Angstrom. Antiferromagnetism. Antimatter. Antineutron. Antiproton. Atom. Atomic beams. Atomic clock. Atomic constants. Atomic mass unit. Atomic number. Atomic physics. Atomic structure and spectra. Atomic weight. Auger effect. Barvon. Binding energy, nuclear. Boltzmann constant. Boltzmann statistics. Boltzmann transport equation. Bose-Einstein statistics. Bremsstrahlung. Cascade particle. Chemical binding. Collision. Compton effect. Conduction band. Conservation of mass. Degeneracy (quantum states). Deuteron. Diamagnetism. Donor atom.

Eigenfunction. Eigenvalue. Electron. Electron capture. Electron configuration. Electron paramagnetic resonance spectroscopy. Electron spin. Electron volt. Elementary particle. Elements (chemical). Energy level (quantum mechanics). Excited state. Exclusion principle. Fermi-Dirac statistics. Fine structure (spectrum lines). Ferromagnetism. Flame photometry. Gravitation. Ground state. Harmonic oscillator. Hyperfine structure. Hyperon. Ion. Isobar (atomic physics). Isoelectric sequence. Isomerism, nuclear. Isotone. Isotope. Isotope shift. Isotope spin. Larmor precession. Lepton. Magnetic moment, electron. Magnetic resonance. Magnetism. Magnetization. Magneton. Mass defect. Mass number. Mass spectroscopy. Mendelevium. Meson. Metastable state. Microradiography. Microwave spectroscopy. Molecular beams. Multipole radiation. Muonium. Neptunium. Neutrino. Neutron. Neutron, delayed. Neutron cross section. Neutron diffraction. Nobelium. Nuclear moments. Nuclear physics. Nuclear structure. Nucleon. Nucleus, atomic. Packing fraction. Paramagnetism. Parity (quantum mechanics). Paschen-Back effect. Periodic table. Perturbation (quantum mechanics). Planck's constant. Positron. Positronium. Proton. Quantum (physics). Quantum electrodynamics.

namics. Quantum mechanics. Quantum numbers. Quantum statistics. Quantum theory. nonrelativistic. Radiation. Radiation chemistry. Radioactivity. Radio-frequency spectroscopy. Radiography. Ritz's combination principle. Rydberg constant. Scattering experiments. atomic and molecular. Scattering experiments. nuclear. Scattering matrix. Schrödinger's wave equation. Selection rules (physics). Spark chamber. Specific charge. Spin (quantum mechanics). Stark effect. Stationary state. Strange particle. Symmetry laws (physics). Triton. Uncertainty principle. Valence band. V-particle. Work function (electronic). X-ray crystallography. X-ray diffraction. X-ray fluorescence analysis. X-unit. Zeeman effect.

For more detailed nuclear aspects see NUCLEAR PHYSICS.

## **Automotive engineering**

See MECHANICAL ENGINEERING.

## **Bacteriology**

Ablastin. Actinobacteraceae. Acid-fast stain. Actinomycetaceae. Actinomycetales. Actinoplanaceae. Aerobacter. Agar. Agglutination reaction. Agglutinin. Anthrax. Antibacterial agents. Antibiotic. Antibody. Antigen. Antigen-antibody reaction. Antiseptic. Antitoxin. Azotobacteraceae. Bacillaceae. Bacillary dysentery. Bacteria. Bacteri. Isogenic. Bacteria. taxonomy of. Bacterial cell chemistry. Bacterial coenzyme. Bacterial endospores. Bacterial enzyme. Bacterial genetics. Bacterial growth. Bacterial luminescence. Bacterial metabolism. Bacterial motility. Bacterial nutrition. Bacterial physiology. Bacteriology. Bacteriology, medical. Bacteriophage. Bacteroidaceae. Beggiatoales. Biological specificity. Biologicals. Blood-plate hemolysis. Botulism. Brevibacteriaceae. Brucellaceae. Brucellosis. Caryophanales. Caulobacteraceae. Chemotherapy. Chlamydothales. Cholera vibrio. Coli-phage. Complement (serum). Complement-fixation test. Conglutination. Cornubacteriaceae. Culture. elective. Culture. media components of. Culture. pure. Culture technique. Cystitis. Diphtheria. Disease carrier. Drug resistance. Effective dose 50. Endocarditis. Enteric bacilli. Enterobacteriaceae. Epidemic. Epidemiology. Escherichia. Fermentation. Food poisoning. bacterial. Food preservation. Food spoilage. Foot and mouth disease. Gaffkya tetragena. Gangrene. gas. Germ. Glanders. Gonorrhea. Gram's stain. Gram-negative diplococci. Hemophilic bacteria. Hemorrhagic septicemia. Heterophiles antigen. Humus. Hyaluronidase. Hyphomicrobiales. Immunity. Immunological tolerance. acquired. Immunology. IMViC test. Infant diarrhea. Infectious disease control. Infective dose 50. Iron transport compounds. microbial. Isoantigen. Isonicotinic acid hydrazide. John's disease. Klebsiella pneumoniae. Lactobacillaceae. Lancefield differentiation scheme. Leprosy. Leptospira. Lethal dose 50. Leukocidin. Lyophilization. Lysin. Lytic reaction. Mastitis. Melioidosis. Meningitis. Meningococcus. Methanomonadaceae. Micrococaceae.

Moraxella lacunata. Mycobacteriaceae. Mycoplasma. Mycobacteriales. Mycobacteriales.

Neisseriaceae. Neutralization reaction (antibody). Neutralizing antibody. Nitrobacteriaceae. Nitrogen cycle. Opsonin. Paracolon bacilli. Parapertussis. Paratyphoid fever. Paratyphoid gastroenteritis. Pasteurization. Pathogen (soil). Phagocytosis. Pink eye. Pinta. Plague. Pleuropneumonia-like organism (PPL.O). Pneumococcus. Pneumonia. Precipitin. Precipitin test. Properdin. Propionibacteriaceae. Proteus. Pseudomonadaceae. Pseudomonadales. Pseudomonadineae. Pseudomonas aeruginosa. Pseudotuberculosis. Public health. Quellung reaction. Rat-bite fever. Relapsing fever. Rheumatic fever. Rhizobiaceae. Rhodobacteriaceae. Salmonella. Scarlet fever. Schizomycetes. Septicemia. Serology. Shigella. Siderocapsaceae. Skin test. Soft chancre. Spirillaceae. Spirochaetales. Spirochete. Stain (microbiological). Sterilization. Streptomyces. Syphilis. Thiobacteriaceae. Transduction. bacterial. Transformation. bacterial. Tuberculariaceae. Tuberculosis. Tularemia. Typhoid fever. Vaccination. Venereal disease. Vincent's angina. Virulence. Water analysis. Water-borne disease. Weil's disease. Whooping cough. Zoonoses.

For more articles on the chemistry of the physiological processes see BIOCHEMISTRY. For information on the role of bacteria in plant disease see PLANT PATHOLOGY; for information on the role of bacteria in water and sewage see SANITARY ENGINEERING.

See also MEDICAL MICROBIOLOGY; MICROBIOLOGY.

## **Biochemistry**

Acetyl phosphate. Acetylcholine. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Adrenal cortex steroid. Adsorption. Alanine. Albumin. Aldosterone. Amino acids. para-Aminobenzoic acid. Amphoterism. Amylase. Androgen. Arginine. Ascorbic acid. Asparagine. Aspartic acid. Auxin. Bile acid. Bilirubin. Biochemistry. Biological oxidation. Biotin. Blood. Buffer solution. Calcium metabolism. Carbohydrate. Carbohydrate metabolism. Carboxylic acid. Carotenoid. Catalysis. Cetyl alcohol. Chelation. Chemical energy. Chemical warfare. Chitin. Chlorophyll. Cholesterol. Choline. Coacervation. Coenzyme. Colloid. Creatine-creatine. Cysteine. Cystine. Cytochemistry. Cytochrome.

Dextrin. Dialysis. Digitoxigenin. Diphosphopyridine nucleotide (DPN). Donnan equilibrium. Electrophoresis. Enantiomorph. Enzyme. Enzyme inhibition. Epinephrine. Equilibrium. chemical. Equilibrium. ionic. Equilibrium. phase. Ergosterol. Estrogen. Fibrinogen. Flavone. Folic acid. Fructose. Galactose. Gamma globulin. Gel. Globulin. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glutamic acid. Glutamine. Glutelin. Glycine. Glycogen. Glycolipid. Gonad. Hemoglobin. Histidine. Hormone. Hormone, adenohipophyseal. Hormone, adrenal cortex. Hormone, adrenal medullary. Hormone, neurohypophyseal. Human genetics. Hyaluronic acid. Hydrogen bond. Hypophysis. Inositol.

Insulin. Interface of phases. Inulin. Ion-permeable membrane. Iron metabolism. Isoelectric point. Isoleucine. Krebs cycle. Lactase. Lactose. Leucine. Levan. Lipid. Lipid metabolism. Lysine. Maltase. Maltose. Metabolic disorders. Metabolism. Metabolism in ruminants. Methionine. Monosaccharide. Niacin. Nucleic acid. Nucleoprotein. Nutrition.

Oligosaccharide. Oncology. Pancreas. Pantothenic acid. Peptide. Phenylalanine. Phosphate metabolism. Phosphatide. Photochemistry. Plasmal. Polysaccharide. Porphyrin. Progesterone. Prolamine. Proline. Protein. Protein, fibrous. Protein, globular. Protein metabolism. Pyrimidine. Pyrrole. Racemization. Radiation biochemistry. Raffinose. Riboflavin. Serine. Serotonin. Serum. Specialized tissue. Sphingolipid. Squalene. Steroid. Sterol. Sucrose. Surface phenomenon. Surface tension. Thiamine. Threonine. Thyroid gland. Transamination. Triglyceride. Triphosphopyridine nucleotide (TPN). Tryptophan. Tyrosine. Ultracentrifuge. Urea (biochemistry). Uric acid. Uridine diphosphate (UDPG). Urine. Valine. Vitamin. Vitamin A. Vitamin B<sub>1</sub>. Vitamin B<sub>2</sub>. Vitamin D. Vitamin E. Vitamin K. X-ray diffraction.

For information on the disease processes see ANIMAL PATHOLOGY; for articles in animal physiology see COMPARATIVE PHYSIOLOGY; for other articles on carbon compounds see ORGANIC CHEMISTRY.

## Biology

Biology. Botany. Zoology.

See also AGRICULTURE; ANIMAL ANATOMY; ANIMAL ECOLOGY; ANIMAL PATHOLOGY; ANIMAL SYSTEMATICS; ANTHROPOLOGY; BIOCHEMISTRY; BIOPHYSICS; COMPARATIVE PHYSIOLOGY; CYTOLOGY; EVOLUTION; FOOD ENGINEERING; FORESTRY; GENERAL PHYSIOLOGY; GENETICS; GROWTH AND MORPHOGENESIS; HISTOLOGY; INVERTEBRATE ZOOLOGY; MEDICAL MICROBIOLOGY; MICROBIOLOGY; MYCOLOGY; PALEOBOTANY; PALEONTOLOGY; PLANT ANATOMY; PLANT ECOLOGY; PLANT PATHOLOGY; PLANT PHYSIOLOGY; PLANT TAXONOMY; PSYCHOLOGY. PHYSIOLOGICAL AND EXPERIMENTAL; SANITARY ENGINEERING; VERTEBRATE ZOOLOGY.

## Biophysics

Abration. optical. Autoradiography. Aviation medicine. Behavioral psychophysics. Biological effects of sound waves. Biophysics. Biophysics, mathematical. Biopotentials and electrophysiology. Birefringence. Bone (biophysics). Cell (biological). spectral analysis of. Cell-surface ionization. Chromatic aberration. Cybernetics. Cytology (molecular basis). Decompression illness. Dichroism. Dichroism (biological tissue). Electrocardiography. Electrodiagnosis. Electroencephalography. Electromagnetic radiation. Electromyogram. Electrophysiology (heart). Electrotherapy. Gas dynamics. Gravity. Health physics. Historadiography. Information theory (biological applications). Infrared radiation (biology).

Linear energy transfer (biology). Mechano-

receptors. Micromanipulation. Microscope. Microscope, centrifuge. Microscope, electron. Microscope, fluorescence. Microscope, interference. Microscope, optical. Microscope, phase contrast. Microscope, reflecting. Microscope, x-ray. Molecular biophysics. Muscle (biophysics). Nuclear radiation (biology). Open system, thermodynamics of (biology). Optics. Oximetry. Phonocardiography. Physiological action spectra. Prosthesis. Rad. Radiation biochemistry. Radiation biology. Radiation cytology. Radiation injury (biology). Radiation microbiology. Radioactivity (applications). Radioisotope (biology). Radiology. Respiration, external. Space biology. Spirometry. Symballophone. Thermodynamic principles. Thermodynamic processes. Thermotherapy. Ultraviolet radiation. Ultraviolet radiation (biology). Vectorcardiography. Weightlessness.

For applications in other fields see ACOUSTICS; ANIMAL PATHOLOGY; FLUID MECHANICS.

## Botany

Botany.

See also AGRICULTURE; BIOCHEMISTRY; CONSERVATION; CYTOLOGY; FORESTRY; MICROBIOLOGY; MYCOLOGY; PALEOBOTANY; PLANT ANATOMY; PLANT ECOLOGY; PLANT PATHOLOGY; PLANT PHYSIOLOGY; PLANT TAXONOMY.

## Chemical engineering

Abrasive. Adhesive. structural. Alkylation. Amination. Autoclave. Bergius process. Bleaching. Boiler feed-water regulation. Boiler water. Boundary-layer flow. Boyle's law. Brick. Cement. Cement-ash. Cetane number. Centrifugal pump. Centrifugation. Ceramic technology. Charcoal. Charles' law. Chemical engineering. Chemical fuel. Chemical process control. Chemical warfare. Chemurgy. Clarification. Classification, mechanical. Clay products, architectural. Coal chemicals. Coal gasification. Coke. Combustion. Concrete. Condenser, vapor. Contact condenser. Cooling tower. Cryogenic engineering. Cryogenics. Crystallization. Cyanoethylation.

Dehumidifier. Dehydrogenation. Desiccant. Destructive distillation. Detonator. Diffusion in gases and liquids. Dimensional analysis. Displacement pump. Drier (paint). Drying. Dust and mist collection. Dyeing. Economizer and air heater. Electrochemical process. Electrolytic tank. Enamel, nonvitreous. Energy sources. Enthalpy. Entropy. Enzyme (industrial production). Esterification. Evaporator. Explosion and explosive. Explosive forming. Feed water. Fertilizer. Fiber, man-made. Fiber, natural. Filler. Filtration. Fire detector. Fire extinguisher. Fischer-Tropsch process. Flame. Flameproofing. Flow measurement. Flow of fluids. Fluid dynamics. Fluid mechanics. Fluid statics. Fluid-flow principles. Fluid-flow properties. Fluidization of solids. Food engineering. Food manufacturing. Fossil fuel. Frit. Fuel. Fuel gas. Fuel gas supplements. Furnace (steam generating). Furnace construction. Fuse, explosive.

Gas absorption operations. Gas furnace. Glass and glass products. Glazing. Halogenation. Heat exchanger. Herbicide. High-pressure physics. High-pressure processes. Humidification. Humidistat. Humidity control. Hydraulics. Hydrodynamics. Hydroformylation. Hydrogenation. Hydrolytic processes. Hydromechanics. Hydrostatics. Hygrometer. Ice manufacture. Incendiary. Incompressible flow. Insecticide. Instrumental analysis. Isothermal process. Isotope separation (stable isotopes). Japaning. Jet flow. Kiln. Lacquer. Laminar flow. Leaching. Leather and fur processing. Lignite. Lime (industrial). Liquefaction of gases. Magnetic separation methods. Mass-transfer operation. Metric system. Mixing. Mortar. Naval stores. Navier-Stokes equation. Newtonian fluid. Nitration. Nitrogen fixation. Nuclear engineering. Nuclear fuels. Nuclear fuels reprocessing. Oxidation process. Paint. Paper and paper products. Particle properties. Pesticide. Photographic materials. Photography. Pigment. Pine oil. Pipe flow. Pitot tube. Plaster. Plaster of paris. Plastics fabrication. Porcelain. Pottery. Prilling. Primer (explosive). Primer (surface coating). Propellant. Pyrolysis. Pyrometric cone. Pyrotechnics. Refractory. Refrigeration. Refrigeration cycle. Reynolds number. Rheology. Rodenticide. Roll mill. Rosin oil. Rubber. Rubber products. Safety glass. Saline water reclamation. Screening. Screening smoke. Sea water. Sedimentation (industrial). Separation (mechanical). Sewage treatment. Shaped charge. Shellac. Sintering. Size reduction. Smoke. Solar energy. Solids pump. Solvent extraction. Spinning (textile). Stained glass. Stripping. Sulfonation. Surface coating. Terra cotta. Textile. Textile chemistry. Textile printing. Thickening. Thinner. Tile. Transesterification. Turbulent flow. Unit, systems of. Unit operations. Unit processes. Varnish. Ventilation. Water softening. Water treatment. Wood chemicals. Wood fiber products. Wood finishing. Zipper.

For applications of agricultural chemistry *see* AGRICULTURE. For construction applications *see* CIVIL ENGINEERING. For unit operation and unit processes production applications *see* INORGANIC CHEMISTRY; MICROBIOLOGY; MINING ENGINEERING; NUCLEAR ENGINEERING; NUCLEAR PHYSICS; PETROLEUM CHEMISTRY. For the theoretical aspects of this subject *see* PHYSICAL CHEMISTRY.

## **Chemistry**

*See* ANALYTICAL CHEMISTRY; BIOCHEMISTRY; CHEMICAL ENGINEERING; INORGANIC CHEMISTRY; ORGANIC CHEMISTRY; PETROLEUM CHEMISTRY; PHYSICAL CHEMISTRY.

## **Civil engineering**

Air-entraining portland cement. Airport engineering. Alidade. Arch. Architectural acoustics. Architectural engineering. Azimuth. Beam. Beam column. Blasting. Bolted joint. Breakwater. Bridge.

Bridge vibration. Brittleness. Buildings. Bulkhead. Bulldozer. Caisson foundations. Canal. Cantilever. Cement. Cement-asbestos. Chimney. Civil engineering. Clinometer. Coastal engineering. Cofferdam. Column. Composite beam. Concrete. Concrete beam. Concrete column. Concrete slab. Construction engineering. Construction equipment. Construction methods. Contour. Crane hoist. Dam. Derrick. Dredge. Earthmover. Electroosmotic dewatering. Engineering and architectural contracts. Engineering geology. Excavator. Floor construction. Foundations. Furnace construction. Girder. plate. Grab bucket. Groin (engineering). Grout. Gunite. Gypsum plank. Harbor. Highway engineering. Imhoff tank. Industrial meteorology. Inland waterways transportation. Jetty. Joint (mechanical). Level (surveying). Loading, transverse. Loads, dynamic. Loads, repeated. Lumber manufacture. Masonry. Mortar. Noise control in buildings. Pavement. Photogrammetry. Pier. Pile foundation. Pipeline. Plane table. Plate, structural. Portland cement. Precast concrete. Prestressed concrete. Railroad engineering. Reinforced concrete. Reservoir. Retaining wall. Revetment. River engineering. Riveted joint. Roof construction. Runway, airport. Safety factor. Sanitary engineering. Sea wall. Septic tank. Sewage. Sewage collection systems. Sewage disposal. Sewage solids. Sewage treatment. Shovel, power. Soil mechanics. Stadia. Structural analysis. Structural connections. Structural deflections. Structural materials. Structural steel. Structures (engineering). Surveying. Tank. Theodolite. Topographic surveying and mapping. Tower. Traffic engineering. Transit (engineering). Transportation engineering. Trestle. Truss. Tunnel. Unloader. Wall construction. Water conservation. Water pollution. Water softening. Water supply engineering. Water treatment. Welded joint. Wellpoint systems. Wharf. Wood fiber products. Wood finishing. Wood physics. Wood preservation.

For mechanics and properties of materials *see* ENGINEERING MECHANICS. For hydraulics articles *see* FLUID MECHANICS. For mapping articles *see* PHYSICAL GEOGRAPHY. For related articles in the fields of geology and hydrology *see* ENGINEERING GEOLOGY; GEOLOGY (SURFICIAL AND HISTORICAL); HYDROLOGY.

## **Classical mechanics**

Acceleration. Acceleration measurement. Action. Amplitude (wave motion). Angular frequency. Angular momentum. Anharmonic oscillator. Antigravity. Balance (weighing instrument). Ballistics, exterior. Ballistics, interior. Beat. Bourdon-spring pressure gage. Canonical transformations. Cayley-Klein parameters. Celestial mechanics. Center of gravity. Center of mass. Center of pressure. Centrifugal force. Centripetal force. Centrode. Centroids of areas and lines. Collision. Conservation of energy. Conservation of momentum. Constraint. Couple. D'Alembert's principle. Damp-

ing. Degree of freedom (mechanics). Density. Density measurement. Dimensional analysis. Dimensions (mechanics). Displacement (mechanics). Doppler effect. Dynamics. Dyne. Earth. Empirical method. Energy. Equilibrium of forces. Erg. Euler angles. Euler's equations of motion. Foot (unit). Foot-pound. Foot-poundal. Force. Forced oscillations. Foucault pendulum. Frame of reference. Free fall. Frequency (wave motion). Fundamental frequency. Galilean transformations. Gas. Gram. Gravitation. Gravity. Group velocity. Hamilton's equations of motion. Hamilton's principle. Hamilton-Jacobi theory. Harmonic (periodic phenomena). Harmonic motion. Harmonic oscillator. Horsepower. Hydrometer. Hypothesis. Impact (impulsive force). Impedance, mechanical. Impulse (mechanics). Inertia. Interference of waves. Jet propulsion. Kilogram. Kinematics. Kinetics (classical mechanics). Lagrange's equations. Lagrangian function. Least action, principle of. Length. Level measurement. Lissajous figures. Manometer. Mass. Matter (physics). McLeod gage. Mean free path. Measure. Mechanical vibration. Mechanics. Mechanics, classical. Meter (unit). Metric system. Micron. Minimal principles. Missile. Mode of vibration. Moment of inertia. Momentum. Motion. Motion, rectilinear. Newton. Newton's laws of motion. Nutation (astronomy and mechanics). Oscillation. Particle. Pendulum. Period (periodic phenomena). Periodic motion. Perpetual motion. Perturbation (quantum mechanics). Phase (periodic phenomena). Phase velocity. Physical law. Physical measurement. Physical science. Physics. Poincaré's method. Postulate. Potentials (physics). Pound. Poundal. Power. Precession. Pressure. Pressure transducer. Product of inertia. Radiation. Radius of gyration. Refraction of waves. Relative motion. Resonance (acoustics and mechanics). Resultant of forces. Rigid body. Rigid body dynamics. Rotational motion. Science. Scientific methods. Sine wave. Slug (unit). Specific gravity. Speed. Standard. Standing wave. Statics. Statics in space. Stationary wave. Sympathetic vibration. Theorem. Theory, physical. Time constant. Torque. Trajectory. Tuning fork. Units, systems of. Vacuum measurement. Velocity. Vernier. Vibration. Vibration damping. Virtual work, principle of. Wave (physics). Wave equation. Wave motion. Wavelength. Weight. Weight measurement. Work.

For engineering applications see **ENGINEERING MECHANICS**. For statistical, relativistic, and quantum mechanics see **ATOMIC PHYSICS; MOLECULAR PHYSICS; SOLID-STATE PHYSICS; THEORETICAL PHYSICS**.

## Climatology

See **METEOROLOGY AND CLIMATOLOGY**.

## Communications

Airborne radar. Amateur radio. Amplitude modulation. Amplitude-modulation detector. Amplitude-

modulation radio. Amplitude modulator. Angle modulation. Antenna (aerial). Audio amplifier. Automatic frequency control (AFC). Automatic gain control (AGC). Bandwidth requirements (communications). Carrier. Cascode amplifier. Cavity resonator. Choke (filter). Closed-circuit television. Coaxial cable. Color television. Communications, electrical. Communications satellite. Communications systems protection. Communications systems (traffic) design. Continuous-wave radar. Corner reflector antenna. Counting circuit. Crosstalk. Data communications. Demodulator. Detector. Directional coupler. Discriminator. Distortion (electronic circuits). Doppler radar. Echo box. Electronic countermeasures. Equalization, frequency-response. Facsimile. Fidelity. Filter, electric. Frequency modulation. Frequency-modulation detector. Frequency-modulation radio. Frequency modulator. Heterodyne principle. High fidelity. Image orthicon. Impedance matching. Information theory. Intercommunicating system. Interference, electrical. Intermediate-frequency amplifier. Jamming. Kinescope. Laser. Literature of science and technology. Loudspeaker. Microphone. Microwave. Microwave optics. Microwave transmission lines. Mixer. Modulation. Modulator. Monopulse radar. Moving-target indication. Multiplexing. Navigation systems, electronic. Noise, electrical. Noise filter, radio. Noise generator, electrical. Passive radar. Phase modulation. Phase-modulation detector. Phase modulator. Privacy systems (scrambling). Pulse modulation. Pulse modulator.

Radar. Radio. Radio broadcasting. Radio broadcasting networks. Radio receivers. Radio spectrum allocations. Radio transmitter. Radio-wave propagation. Radome. Scaling circuit. Selectivity. Sensitivity. Series. Signal-to-noise ratio. Shielding, electrical. Sideband. Sound reproduction systems, electrical. Static. Superheterodyne receiver. Suppression. Suppressor. Surveillance radar. Switching circuit. Switching systems (communications). Switching theory. Switching tubes. Systems engineering. Telecast. Telegraphy. Telemetering. Telephone. Telephone civil defense system. Telephone private branch exchange (PBX). Telephone service. Telephone signaling, special subscriber. Telephone systems construction. Telephony. Telephotography. Teletypesetter. Teletypewriter. Teletypewriter exchange (TWX) service. Television. Television camera. Television camera tube. Television networks. Television receiver. Television scanning. Television standards. Television studio. Television transmitter. Telex. Transmission lines. Transmission theory and methods. Tuner. Tuning. Underwater telephone. Video amplifier. Vocoder. Wave guide. Yagi antenna.

For articles on basic electron devices and circuits see **ELECTRONIC ENGINEERING**. For electrical circuit theory see **ELECTRICAL ENGINEERING**. For electromagnetic radiation phenomena see **ELECTROMAG-**

NETIC RADIATION. For transmission of information by sound waves *see* ACOUSTICS. For electronic navigation equipment *see* NAVIGATION. For technical aspects of human communication through printing and other visual means *see* GRAPHICS AND GRAPHIC ARTS; PHOTOGRAPHY.

## Comparative physiology

Acetyl phosphate. Acetylcholine. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Adrenal cortex steroid. Adrenal gland. Alanine. Albumin. Aldosterone. Amino acids. para-Aminobenzoic acid. Amylase. Androgen. Animal growth. Arginine. Ascorbic acid. Asparagine. Aspartic acid. Autotomy. Bile acid. Bilirubin. Biochemistry. Bioelectric model. Biological oxidation. Bioluminescence. Biotin. Blood. Blood groups. Calcium metabolism. Carbohydrate. Carbohydrate metabolism. Cardiovascular system. Cell (pressure-temperature effects). Cell membranes and monolayers. Centrifugation (biology). Cetyl alcohol. Chemoreception. Chitin. Cholesterol. Choline. Chromatophore. Circulation. Coenzyme. Creatine-creatinine. Cysteine. Cystine. Cytochrome. Dextrin. Digestive system. Digitoxigenin. Diphosphopyridine nucleotide (DPN).

Electric organ (biology). Endocrine mechanisms. Endocrinology. Energy metabolism. Enzyme. Enzyme inhibition. Ephaptic transmission. Epinephrine. Equilibrium, biological. Ergosterol. Estrogen. Excretion. Feces. Feeding mechanisms and digestion. Fibrinogen. Folic acid. Fructose. Galactose. Gallbladder. Gamma globulin. Gestation period. Globulin. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glutamic acid. Glutamine. Glutelin. Glycine. Glycogen. Glycolipid. Gonad. Heart (ganglionic pacemaker). Hemoglobin. Hibernation. Histidine. Homeostasis. Hormone. Hormone, adenohypophyseal. Hormone, adrenal cortex. Hormone, adrenal medullary. Hormone, neurohypophyseal. Hyaluronic acid. Hypophysis. Inositol. Insect physiology. Insulin. Inulin. Iron metabolism. Isoleucine. Krebs cycle. Lactase. Lactation. Lactose. Leucine. Levan. Lipid. Lipid metabolism. Liver. Lymphatic system. Lysine. Maltase. Maltose. Menstruation. Metabolism. Metabolism in ruminants. Methionine. Microscope, centrifuge. Monosaccharide. Muscular system. Nervous system. Nervous system (invertebrate). Niacin. Nitrogen excretion. Nucleic acid. Nucleoprotein. Nutrition. Oligosaccharide. Oncology. Osmoregulatory mechanisms. Ovary. Pancreas. Pantothenic acid. Parathyroid gland. Peptide. Periodicity in organisms. Phenylalanine. Phonetics. Phonoreception. Phosphate metabolism. Phosphatide. Photoreception. Physiological acoustics. Physiology, general. Plasmal. Polysaccharide. Porphyrin. Progesterone. Proline. Proline. Protein. Protein, fibrous. Protein, globular. Protein metabolism. Raffinose. Regeneration (biology). Reproductive system. Respiration. Respiratory pigments. Respiratory system. Riboflavin. Serine. Serotonin. Serum. Sight. Skeletal

system. Specialized tissue. Speech. Sphingolipid. Steroid. Sterol. Sucrose. Synaptic transmission. Taxis. Testis. Thermoregulation. Thiamine. Threonine. Thyroid gland. Transamination. Triglyceride. Triphosphopyridine nucleotide (TPN). Tryptophan. Tyrosine. Urea (biochemistry). Uric acid. Uridine diphosphoglucose (UDPG). Urinary system. Urine. Valine. Vitamin. Vitamin A. Vitamin B<sub>6</sub>. Vitamin B<sub>12</sub>. Vitamin D. Vitamin E. Vitamin K. For physiological aspects of certain groups of plants *see* MICROBIOLOGY; PLANT PHYSIOLOGY; for certain behavioral aspects of vertebrates *see* PSYCHOLOGY. PHYSIOLOGICAL AND EXPERIMENTAL.

*See also* GENERAL PHYSIOLOGY.

## Computers and information processing

Abacus. Analog computer. Analog-to-digital converter. Binary number system. Bit. Boolean algebra. Calculating machines. Cam mechanism. Computer. Counter, digital. Counting circuit. Data processing systems. Data reduction. Data transmission. Decimal number system. Differential analyzer. Digital computer. Digital computer programming. Digital-to-analog converter. Dynamic analogies. Electrolytic tank. Gate circuit. Information theory. Magnetic recording. Magnetic thin films. Microcircuitry. Number systems. Octal number system. Pulse generator. Scaling circuit. Simulator. Slide rule. Storage devices. Switch, electronic. Switching circuit. Switching theory. Switching tubes.

For applications of computers, *see* the particular field of interest. For use of computers with automatic control systems *see* CONTROL SYSTEMS ENGINEERING.

## Conservation

Conservation of resources. Dune vegetation. Ecology, applied. Fisheries conservation. Forest conservation. Land use planning. Mineral resources conservation. Range land conservation. Soil conservation. Water conservation. Wildlife conservation.

For economic aspects *see* AGRICULTURE; FORESTRY; for environmental aspects *see* ANIMAL ECOLOGY; PHYSICAL GEOGRAPHY.

## Control systems engineering

Accelerometer. Alarm systems. Automation. Autopilot. Chemical process control. Clock control systems. Closed-loop control system. Computer control system. Control systems. Cybernetics. Damping. Environmental test. Feedback circuit. Feedback control systems. Fire-control systems. Governor. Guidance systems. Guided missile. Humidity control. Hunting. Hydraulic actuator. Magnetic amplifier. Maintainability of equipment. Microcircuitry. Miniaturization of equipment. Missile guidance systems. Open-loop control system. Operations research. Operator training. Packaging of equipment. Pressure control, automatic. Process control. Prototype (equipment). Qualification test.

Regulator. Reliability of equipment. Remote-control system. Repeater, synchro. Sampled-data control system. Saturable reactor. Servomechanism. Synchro. Systems engineering. Telemetering. Temperature control, automatic. Traffic control systems.

For analog and digital computers and for data processing equipment *see* COMPUTERS and INFORMATION PROCESSING. For basic electrical circuitry and components *see* ELECTRICAL ENGINEERING. For electronic circuits and components *see* ELECTRONIC ENGINEERING. For mechanical, hydraulic and pneumatic devices *see* MECHANICAL ENGINEERING.

## Cryogenic engineering

*See* CHEMICAL ENGINEERING.

## Cytology

Autoradiography. Cell (biological). Cell (biological), spectral analysis of. Cell (pressure-temperature effects). Cell constancy. Cell division. Cell inclusions, noncytoplasmic. Cell lineage. Cell membranes and monolayers. Cell nucleus. Cell organization. Cell plastids. Cell protoplast. Cell structures. Cell walls in plants. Cell-surface differentiation. Cell-surface ionization. Centriole. Centrosome. Chromosome. Chromosome aberration. Chromosome theory of heredity. Cytochemistry. Cytokinesis. Cytology. Cytology (molecular basis). Cytoplasm. Cytoplasmic inheritance. Deoxyribonucleic acid. Gene. Gene action. Golgi component. Lethal gene. Meiosis. Microscope. Microscope, electron. Microscope, fluorescence. Microscope, interference. Microscope, optical. Microscope, phase contrast. Microtechnique. Mitochondria. Mitosis. Mutation. Oogenesis. Polyploidy. Protoplasm. Recombination, genetic. Ribonucleic acid. Sex determination. Sperm cell. Spermatogenesis.

For more information on the chemistry of various physiological processes *see* BIOCHEMISTRY; for further information on cells in tissues *see* HISTOLOGY.

## Ecology

*See* ANIMAL ECOLOGY; PLANT ECOLOGY.

## Electrical engineering

Admittance. Alternating current. Alternating-current circuit theory. Alternating-current generator. Alternating-current motor. Alternator. Ammeter. Amplifier. Antiresonance. Arc heating. Arc lamp. Arc welding. Armature. Armature reaction. Attenuator. Audio amplifier. Autotransformer. Backward-wave tube. Ballast resistor. Battery (electric). Beam-power tube. Bias (electron tube). Blocking oscillator. Blowout coil. Bonding. Bootstrap circuit. Brake. Branch circuit. Breadboarding. Breakdown. Bridge circuit. Bus-bar. Calibration. Candle. Candlepower. Capacitance box. Capacitance measurement. Capacitor. Cascode amplifier. Cathode follower. Cathode-ray tube. Cell (electric). Choke

(filter). Chopper. Circuit, electric. Circuit, electronic. Circuit breaker. Circuit testing, electrical. Clamping circuit. Clipping circuit. Clutch. Coaxial cable. Cockcroft-Walton accelerator. Coil. Coincidence amplifier. Communications, electrical. Communications satellite. Communications systems protection. Commutation. Commutator. Comparator circuit. Conductance. Conductor, electric. Connector, electric. Contact, electric. Contact rectifier. Controlled rectifier. Converter, synchronous. Copper loss. Corbino disk. Corbinotron. Core loss. Corona discharge. Coupled circuits. Current balance. Current measurement. Crosstalk. Cryosar. Cytotron.

Data transmission. Delay line. Dielectric heating. Digital voltmeter. Diode, semiconductor. Diode, vacuum. Direct current. Direct-coupled amplifier. Direct-current circuit theory. Direct current generator. Direct-current motor. Distortion (electronic circuits). Dry cell. Dynamic braking. Dynamo. Dynamometer. Edison battery. Electric distribution systems. Electric energy measurement. Electric furnace. Electric power generation. Electric power measurement. Electric power substation. Electric power systems. Electric protective devices. Electric rotating machinery. Electrical codes. Electrical degree. Electrical engineering. Electrical measurements. Electrical standards. Electric-discharge machining. Electroacoustics. Electrodynamometer. Electrokinetic transducer. Electrolytic tank. Electromagnet. Electromagnetic pump. Electrometallurgy. Electrometer. Electron lens. Electron tube. Electronic wiring. Electronics. Electroplating of metals. Electropolishing. Electrostatic lens. Electrostatic precipitator. Energy conversion. Energy sources. Equivalent circuit. Esaki tunnel diode. Excitation. Exciton.

Facsimile. Feedback circuit. Fidelity. Filter, electric. Flash welding. Fluorescent lamp. Fluxmeter. Foot-candle. Foot-lambert. Frequency divider. Frequency measurement. Frequency multiplier. Fuel cell. Fuse, electric. Gain. Galvanometer. Gas tube. Gate circuit. Generator, electric. Grounding, electrical. Grounding, electronic equipment. Harmonic analyzer. Heating, electric. Heptode. Hexode. Hydroelectric generator. Hysteresis motor. Ignitron. Illuminance. Illumination. Impedance matching. Impedance measurements, high-frequency. Impulse generator. Incandescent lamp. Inductance bridge. Inductance measurement. Induction coil. Induction heating. Induction motor. Inductometer. Inductor. Infrared image converter tube. Infrared lamp. Instability, electrical. Instrument transformer. Instrumentation. Insulation, electric. Insulation resistance testing. Intercommunicating system. Interference, electrical. Intermediate-frequency amplifier. Inverter. Ionization gage. IR drop. Junction diode. Junction transistor. Kelvin bridge. Kirchhoff's laws of electric circuits. Klystron. Lambert. Lamp (electric). Light panel. Light amplifier. Lighthouse tube. Lightning and surge protection. Lightning arrester. Lightning

rod. Limiter circuit. Linear accelerator. Linearity. Lissajous figures. Load line. Loading, electrical. Loudspeaker. Lumen. Lumenhour. Luminaire. Luminance. Luminosity factor. Luminous efficiency. Luminous energy. Luminous flux. Luminous intensity. Lux. Magnet wire. Magnetic amplifier. Magnetic lens. Magneto. Magnetohydrodynamic power generator. Magnetron. Mechanical rectifier. Megger. Mercury battery. Mercury-vapor lamp. Mercury-vapor rectifier. Metallic-disk rectifier. Microcircuitry. Microphone. Microphonic tube. Microwave tube. Mixer. Motor, electric. Motorboating. Motor-generator set. Multimeter. Multivibrator.

Neon glow lamp. Neper. Network theory, electrical. Nuclear battery. Nuclear power. Number indicator tube. Octode. Ohm's law. Ohmmeter. Open circuit. Oscillator. Oscillator. Oscillograph. Oscilloscope, cathode-ray. Parallel circuit. Parametric amplifier. Parasitic oscillation. Particle accelerator. Pentagrid converter. Pentode, vacuum. Phase inverter. Phase meter. Phase-angle measurement. Phot. Photoflash lamp. Photometer. Photometry. Phototube. Phototube, multiplier. Point-contact diode. Point-contact transistor. Potentiometer (variable resistor). Potentiometer (voltage measurement). Power amplifier. Power factor meter. Power plant. Power supply, electronic. Preamplifier. Pressure transducer. Printed circuit. Prony brake. Pulse generator. Push-pull amplifier.

Q meter. Quadrature. Radio-frequency amplifier. Reactor, electric. Recording instruments, graphic. Rectifier. Regeneration (engineering). Regulation. Relaxation oscillator. Relay. Reliability of equipment. Reluctance motor. Repulsion motor. Reserve battery. Resistance heating. Resistance measurement. Resistance welding. Resistor. Resonance (alternating-current circuits). Response. Rheostat. Ripple voltage. Rural electrification. Saturable reactor. Saturation. Saw-tooth wave. Schematic drawing. Selectivity. Semiconductor rectifier. Sensitivity. Series circuit. Shielding, electrical. Short circuit. Shunting. Signal generator. Signal tracer. Silicon diode. Slip. Slip rings. Sodium-vapor lamp. Solar battery. Solar energy. Solenoid (electrical). Solenoid. Speed regulation. Spot welding. Square wave. Stabilization. Storage battery. Storage tube. Strain gage. Stroboscope. Sunlamp. Superposition theorem (electrical networks). Suppressor. Surface-barrier transistor. Surging. Sweep generator. Switch, electric. Switch, electronic. Switching tubes. Synchro. Synchronization. Synchronous condenser. Synchronous motor. Synchronous speed. Synchroscope. Tachometer. Tank circuit. Telegraphy. Telemetering. Telephony. Telephotography. Teletypewriter. Teletypewriter. Teletypewriter exchange (TWX) service. Telex. Tetrode, vacuum. Thermionic power generator. Thermionic tube. Thermistor. Thermocouple. Thermoelectric power generator. Thermometer. Thevenin's theorem (electrical networks). Thyatron. Time constant. Time

delay circuits. Transducer. Transformer. Transient, electric. Transistor. Transistor connection. Transmission lines. Transmission theory and methods. Traveling-wave tube. Trigger circuit. Triode, vacuum. Tube, electron. Tube tester. Tunnel diode. Tunneltron. Ultraviolet lamp. Universal motor. Vacuum tube. Vacuum-tube voltmeter. Van de Graaff generator. Vapor lamp. Varactor. Varistor. Vibration pickup. Vibrator. Video amplifier. Voltage amplifier. Voltage measurement. Voltage regulation. Voltage regulator. Voltage-multiplier circuit. Voltage-regulator tube. Volt-amperes. Voltmeter. Volt-ohm-milliammeter. Water power. Watt-hour meter. Wattmeter. Waveform. Waveform, nonsinusoidal. Waveform determination. Wave-shaping circuits. Wet cell. Wheatstone bridge. Wind power. Windings (electric machinery). Wire. Wiring (electric). Wiring diagram. Y-delta transformations. Zener diode.

For electrical and electromagnetic phenomena and laws see ELECTRICITY AND ELECTROMAGNETISM. For electrochemical phenomena and laws see PHYSICAL CHEMISTRY. For electrical conduction in solids see SOLID-STATE PHYSICS. For electrical conduction in gases and vacuum see ELECTRONIC ENGINEERING. For applications of electrical engineering in other fields see COMMUNICATIONS; COMPUTERS AND INFORMATION PROCESSING; CONTROL SYSTEMS ENGINEERING; NAVIGATION. For generator prime movers see MECHANICAL ENGINEERING.

## Electricity and electromagnetism

Admittance. Alternating current. Ammeter. Ampere. Ampere's law. Ampere-turn. Arc discharge. Attenuation. Attenuator. Ballast resistor. Band theory of solids. Barkhausen effect. Barreter. Biot-Savart law. Bolometer. Breakdown potential. Brush discharge. Calomel electrode. Canal rays. Capacitance. Capacitance box. Capacitance measurement. Capacitor. Cathode rays. Cathodoluminescence. Cell (electric). Characteristic curve. Charge, electric. Chopping. Coil. Condenser, electrical. Conductance. Conduction (electricity). Conductivity. Coulomb. Coulomb's law. Current, electric. Current balance. Current density. Current measurement. Dark current. Degaussing. Demagnetization. Dielectric constant. Dielectrics. Digital voltmeter. Dipole. Dipole moment. Direct current. Eddy current. Electret. Electric energy measurement. Electric field. Electric power measurement. Electrical conduction in gases. Electrical conductivity of metals. Electrical measurements. Electrical standards. Electrical units. Electricity. Electroacoustics. Electrochemical equivalent. Electrochemical process. Electrochemical series. Electrochemistry. Electrode. Electrode potential. Electrodynamical instrument. Electrodynamics. Electrokinetic phenomena. Electroluminescence. Electrolysis. Electrolyte. Electrolytic conductance. Electromagnetic field. Electromagnetism. Electrometer. Electromotive



force (cells). Electromotive force (emf). Electron diffraction. Electron emission. Electron lens. Electron motion in vacuum. Electron optics. Electroosmosis. Electrophoresis. Electrostatic. Electrostatic lens. Electrostatics. Electrostriction. Energy conversion. Excitation. Excitation potential. Farad. Faraday's law of induction. Ferroelectrics. Field emission. Field theory, classical. Field-enhanced emission. Fluxmeter. Free-electron theory of metals. Frequency counter. Frequency measurement. Galvanometer. Gauss. Germanium diode. Gilbert. Glass electrode. Glow discharge. Harmonic analyzer. Helmholtz coils. Henry. Hydrogen electrode. Hysteresis, magnetic. Impedance, electrical. Impedance matching. Impedance measurements, high-frequency. Inductance. Inductance bridge. Inductance measurement. Induction, electromagnetic. Induction, electrostatic. Induction, magnetic. Inductometer. Inductor. Instrument transformer. Insulator, electric. Ionization. Ionization potential. Joule's law. Kelvin bridge. Kinetic theory of matter. Langmuir-Child law. Lenz's law. Lines of force.

Magnet. Magnetic circuits. Magnetic field. Magnetic flux. Magnetic moment. Magnetic lens. Magnetohydrodynamics. Magnetomotive force. Magnetooptics. Magnetostatics. Maxwell. Meissner effect. Mho. Molecular electronics. Multimeter. Oersted. Ohm. Ohm's law. Ohmmeter. Oscillograph. Oscilloscope, cathode-ray. Overvoltage. Permeability, magnetic. Permittivity. Phase (periodic phenomena). Phase meter. Phase-angle measurement. Photoconductivity. Photoelectricity. Photoemission. Photovoltaic effect. Piezoelectricity. Pinch effect. Plasma physics. Polar molecule. Polarity (electricity). Polarization (dielectrics). Potential, electric. Potential difference. Potentials, physics. Potentiometer (variable resistor). Potentiometer (voltage measurement). Power factor. Power factor meter. Pyroelectricity. Q. Q meter. Reactance. Reciprocity, principle of. Recording instruments, graphic. Reflectometer, microwave. Regulation. Relativistic electrodynamics. Reluctance. Resistance, electrical. Resistance measurement. Resistivity, electrical. Resistor. Response. Rheostat. Saint Elmo's fire. Salt bridge. Saturation. Saturation current. Schottky effect. Search coil. Secondary emission. Semiconductor. Skin effect. Space charge. Spark, electric. Spark gap. Spectrum analyzer. Sputtering. Standing wave detector. Static electricity. Striation. Superconductivity. Susceptance. Susceptibility, electric. Synchroscope. Thermionic emission. Thermistor. Thermoelectricity. Townsend discharge. Unified field theory. Vacuum-tube voltmeter. Varistor. Volt. Voltage measurement. Volt-amperes. Voltmeter. Volt-ohm-milliammeter. Watt. Watt-hour meter. Wattmeter. Waveform determination. Wavelength measurement. Wavelength standards. Wavemeter. Weber. Wheatstone bridge.

For articles on electromagnetic radiation *see* ELECTROMAGNETIC RADIATION. For fields of applied electrical physics *see* COMMUNICATIONS;

COMPUTERS AND INFORMATION PROCESSING; CONTROL SYSTEMS ENGINEERING; ELECTRICAL ENGINEERING; ELECTRONIC ENGINEERING. For articles on biological electrical phenomena and applications *see* BIOPHYSICS.

## Electromagnetic radiation

Absorption. Absorption (electromagnetic radiation). Amplitude (wave motion). Angstrom. Antenna (aerial). Band spectrum. Birefringence. Black body. Bremsstrahlung. Cerenkov radiation. Color centers. Color temperature. Compton effect. Conservation of mass. De Broglie wavelength. Diffraction. Dispersion (radiation). Displacement current. Doppler effect. Eigenfunction. Einstein shift. Electric field. Electromagnetic field. Electromagnetic radiation. Electromagnetic wave. Electrooptics. Emissivity. Energy level (quantum mechanics). Equation of continuity. Ether hypothesis. Fine structure (spectrum lines). Franck-Condon principle. Frequency (wave motion). Fundamental frequency. Gamma rays. Ground state. Harmonic (periodic phenomena). Harmonic oscillator. Heat radiation. Heat transfer. Huygens' principle. Hyperfine structure. Incandescence. Inertia of energy. Infrared detector. Infrared radiation. Infrared spectroscopy. Interference of waves. Interferometry. Inverse square law. Isotope shift. Kinetic theory of matter. Laser. Light. Line spectrum. Lines of force. Magnetic resonance. Maser. Maxwell's equations. Micon. Microprobe. x-ray. Micro-radiography. Microwave. Microwave optics. Microwave spectroscopy. Mossbauer effect. Oscillation. Paschen-Back effect. Phase (periodic phenomena). Phase velocity. Photon. Planck's constant. Planck's radiation law. Point source. Polarization of waves. Poynting's vector. Pyrometer. Quantum (physics). Quantum electrodynamics. Quantum field theory. Quantum mechanics. Quantum statistics. Quantum theory, nonrelativistic. Radiation. Radiation pressure. Radio spectrum allocations. Radio-frequency spectroscopy. Radiography. Radiography of metals. Radiometry. Radiomicroscopy. Radiowave propagation. Reciprocity, principle of. Reflection (electromagnetic radiation). Reflection and transmission coefficients. Reflectometer, microwave. Refraction of waves. Relativistic electrodynamics. Ritz's combination principle. Roentgen unit. Scattering (electromagnetic radiation). Schrödinger's wave equation. Sine wave. Solar energy. Spectrochemical analysis. Spectrography. Spectroscopy. Spectrum. Spectrum analyzer. Standing wave. Standing-wave detector. Stationary state. Stationary wave. Superposition, principle of. Ultraviolet radiation. Wave equation. Wave motion. Wave optics. Wavelength. Wavelength measurement. Wavelength standards. Wavemeter. X-ray(s), physical nature of. X-ray diffraction. X-ray optics. X-ray tube. X-unit. Zeeman effect.

For articles concerning the visible wavelengths

see OPTICS. For basic electrical phenomena see ELECTRICITY AND ELECTROMAGNETISM. For electronic phenomena and devices see ELECTRONIC ENGINEERING. For uses of electromagnetic radiation for communications see COMMUNICATIONS.

## Electronic engineering

Acceptor atom. Air traffic control. Airborne radar. Aircraft low-approach systems. Airport surface detection equipment. Altimeter, radio. Amateur radio. Ammeter. Amplifier. Amplitude-modulation detector. Amplitude-modulation radio. Amplitude modulator. Antenna (aerial). Arc discharge. Arc lamp. Attenuator. Audio amplifier. Automatic frequency control (AFC). Automatic gain control (AGC). Automatic landing system.

Backward-wave tube. Barretter. Beam-power tube. Bias (electron tube). Bias (transistor). Blocking oscillator. Bolometer. Bonding. Bootstrap circuit. Breadboarding. Breakdown potential. Bridge circuit. Brush discharge. Calibration. Canal rays. Capacitance box. Capacitance measurement. Capacitor. Cascode amplifier. Cathode follower. Cathode-ray tube. Cathode rays. Cavity resonator. Characteristic curve. Choke (filter). Chopping. Circuit, electronic. Clamping circuit. Clipping circuit. Closed-circuit television. Coaxial cable. Coil. Coincidence amplifier. Cold-cathode tube. Color television. Communications, electrical. Communications satellite. Comparator circuit. Compass, radio. Conductance. Conduction band. Contact potential difference. Contact rectifier. Continuous-wave radar. Controlled rectifier. Corbino disk. Corbinotron. Corner reflector antenna. Corona discharge. Counting circuit. Course-line computer. Crossover network. Crosstalk. Cryosar. Cryotron. Current balance. Current measurement. Cyclotron resonance experiments. Dark current. Data transmission. Decca. Dectra. Delay line. Demodulator. Detector. Digital voltmeter. Diode, vacuum. Direct-coupled amplifier. Directional coupler. Direction-finding equipment. Discriminator. Disk recording. Distortion (electronic circuits). Donor atom. Doppler radar. Echo box. Electric energy measurement. Electric power measurement. Electrical conduction in gases. Electrical measurements. Electrical standards. Electroacoustics. Electrodynamical instruments. Electrometer. Electron. Electron emission. Electron lens. Electron motion in vacuum. Electron optics. Electron tube. Electronic countermeasures. Electronic writing. Electronics. Electrostatic lens. Emitter follower. Equalization, frequency-response. Equivalent circuit. Esaki tunnel diode. Excitation. Excitation potential. Excitron.

Facsimile. Feedback circuit. Ferrite devices. Fidelity. Field emission. Field-emission microscopy. Field-enhanced emission. Filter, electric. Fluorescent lamp. Frequency counter. Frequency divider. Frequency measurement. Frequency modulator. Frequency multiplier. Frequency-modulation detec-

tor. Frequency-modulation radio. Gain. Galvanometer. Gas tube. Gate circuit. Geiger-Müller counter. Germanium diode. Glow discharge. Ground-controlled-approach system (GCA). Grounding, electronic equipment. Ground-position indicator (GPI). Gyration. Hall effect. Harmonic analyzer. Hearing aid. Heptode. Heterodyne principle. Hexode. High fidelity. Hyperbolic navigation system. Ignitron. Image orthicon. Impedance, electrical. Impedance matching. Impedance measurements, high-frequency. Inductance measurement. Inductometer. Inductor. Inertial guidance system. Infrared detector. Infrared image converter tube. Instability, electrical. Instrument landing system (ILS). Instrumentation. Intercommunicating system. Interference, electrical. Intermediate-frequency amplifier. Inverter. Ionization. Ionization chamber. Ionization potential. Jamming. Junction diode. Junction transistor. Kelvin bridge. Kinescope. Klystron. Langmuir-Child law. Lighthouse tube. Limiter circuit. Linearity. Lissajous figures. Load line. Loading, electrical. Logic circuit. Loran. Magnetic lens. Magnetic recording. Magnetron. Maser. Meissner effect. Mercury-vapor lamp. Mercury-vapor rectifier. Microcircuitry. Microphonic tube. Microscope, electron. Microwave. Microwave optics. Microwave transmission lines. Microwave tube. Miniaturization of equipment. Mixer. Modulator. Molecular electronics. Monopulse radar. Motorboating. Moving-target indication. Multimeter. Multiplexing. Multivibrator. Navarho. Navigation systems, electronic. Negative-resistance devices. Neon glow lamp. Noise, electrical. Noise filter, radio. Noise generator, electrical. Number indicator tube. Octode. Ohmmeter. Omega. Oscillator. Oscillator. Oscillograph. Oscilloscope, cathode-ray.

Packaging of equipment. Parametric amplifier. Parasitic oscillation. Particle detector. Passive radar. Pentagrid converter. Pentode, vacuum. Phase inverter. Phase meter. Phase modulator. Phase-angle measurement. Phase-modulation detector. Photoconductive cell. Photoconductivity. Photodiode. Photoelectric devices. Photoelectricity. Photoemission. Phototransistor. Phototube. Phototube multiplier. Photovoltaic cell. Photovoltaic effect. Piezoelectric crystal. Piezoelectricity. Point-contact diode. Point-contact transistor. Polar-coordinate navigation systems. Potentiometer (variable resistor). Potentiometer (voltage measurement). Power amplifier. Power supply, electronic. Power-factor meter. Preamplifier. Precision approach radar (PAR). Pressure transducer. Printed circuit. Privacy systems (scrambling). Pulse generator. Pulse modulator. Pulse transformers. Push-pull amplifier.

Q meter. Quadrature. Quartz clock. Radar. Radio. Radio astronomy. Radio broadcasting. Radio broadcasting networks. Radio range. Radio receivers. Radio spectrum allocations. Radio telescope. Radio transmitter. Radioactivity (applica-

tions). Radio-frequency amplifier. Radio-wave propagation. Radome. Recording. Recording instruments. graphic. Rectifier. Reflectometer. microwave. Regeneration (engineering). Regulation. Relaxation oscillator. Relay. Reliability of equipment. Resistance measurement. Resistor. Resonance (alternating-current circuits). Response. Ripple voltage.

Saint Elmo's fire. Satellite. navigation by. Saturation. Saturation current. Saw-tooth wave. Scaling circuit. Schematic drawing. Schottky effect. Scintillation counter. Secondary emission. Selectivity. Semiconductor. Semiconductor rectifier. Sensitivity. Shielding. electrical. Shunting. Signal generator. Signal tracer. Signal-to-noise ratio. Silicon diode. Sodium-vapor lamp. Solar battery. Sonar. Sound recording. Sound reproduction systems. electrical. Space charge. Spark. electric. Spark gap. Spectrum analyzer. Sputtering. Square wave. Stabilization. Standing-wave detector. Static. Storage devices. Storage tube. Striation. Superconductivity. Superheterodyne receiver. Suppression. Suppressor. Surface-barrier transistor. Surging. Surveillance radar. Sweep generator. Switch. electronic. Switching circuit. Switching theory. Switching tubes. Synchronization. Synchroscope. Tacan. Tank circuit. Telecast. Telegraphy. Telemetering. Telephone. Telephony. Telephotography. Teletypewriter. Teletypewriter exchange (TWX) service. Television. Television camera. Television camera tube. Television receiver. Television scanning. Television transmitter. Telex. Terrain-clearance indicator. Tetrode. vacuum. Thermionic emission. Thermionic tube. Thermistor. Thyatron. Time constant. Time-delay circuits. Townsend discharge. Transducer. Transformer. Transistor. Transistor connection. Transmission theory and methods. Traveling-wave tube. Trigger circuit. Triode. vacuum. Tube. electron. Tube tester. Tuner. Tuning. Tunnel diode. Tunneltron. Ultrasonics.

Vacuum tube. Vacuum-tube voltmeter. Valence band. Varactor. Varistor. Video amplifier. Voltage amplifier. Voltage measurement. Voltage regulator. Voltage-multiplier circuit. Voltage-regulator tube. Voltmeter. Volt-ohmmilliammeter. Vortac. Wave guide. Waveform. Waveform. non-sinusoidal. Waveform determination. Wavelength measurement. Wavelength standards. Wavemeter. Wave-shaping circuit. Wheatstone bridge. Wire recording. Wiring diagram. Work function (electronic). X-ray tube. Yagi antenna. Zener diode.

For a complete list of articles in the field of communications *see* COMMUNICATIONS. For articles on computers *see* COMPUTERS AND INFORMATION PROCESSING. For electronic controls *see* CONTROL SYSTEMS ENGINEERING.

## Embryology

*See* GROWTH AND MORPHOGENESIS. *See also* specific taxonomic groups of animals and plants listed un-

der INVERTEBRATE ZOOLOGY; PLANT KINGDOM; VERTEBRATE ZOOLOGY.

## Engineering

*See* specific engineering fields, such as CHEMICAL ENGINEERING; ELECTRICAL ENGINEERING; NUCLEAR ENGINEERING.

## Engineering drawing

*See* GRAPHICS AND GRAPHIC ARTS.

## Engineering geology

Aerial photograph. Airport engineering. Alidade. Avalanche. Blasting. Boring and drilling (mineral). Breakwater. Bridge. Bulkhead. Caisson foundations. Canal. Clay. Clay minerals. Cleavage. rock. Clinometer. Coastal engineering. Cofferdam. Concrete. Construction engineering. Construction equipment. Construction methods. Dam. Delta. Dune. Earthquake. Electroosmotic dewatering. Engineering geology. Erosion. Exfoliation. rock. Fault and fault structures. Flood plains. Foundations. Frost action. Geophysical exploration. Gravel. Groin (engineering). Ground water. Harbor. Highway engineering. Hydrolaccolith. Jetty. Landslide. Level (surveying). Loess. Mass wasting. Pavement. Permafrost. Photogrammetry. Pier. Pile foundation. Plane table. Railroad engineering. Regolith. Reservoir. Retaining wall. Revetment. River engineering. Rock mechanics. Runway. airport. Sand. Sea wall. Sedimentation (geology). Seismology. Sewage disposal. Shore processes. Snow surveying. Soil mechanics. Solifluction. Stadia. Stone and stone products. Structural geology. Structural petrology. Surface water. Surveying. Terrestrial frozen water. Theodolite. Till. Topographic surveying and mapping. Transit (engineering). Transportation engineering. Tunnel. Water supply engineering. Water table. Weathering processes. Wellpoint systems. Wharf.

For information on the composition and properties of minerals and solid rocks *see* GEOLOGY (MINERALOGY AND PETROLOGY); for articles treating loose sediments and geologic processes of importance in construction engineering *see* GEOLOGY (SURFICIAL AND HISTORICAL); for articles relating to the action of fluids on rock materials *see* HYDROLOGY. For articles on the stresses, strength, and elasticity of materials *see* ENGINEERING MECHANICS. For aspects of boring, drilling, and excavation *see* MINING ENGINEERING; PETROLEUM ENGINEERING.

## Engineering mechanics

Acceleration. Aeroelasticity. Air-velocity measurement. Anelasticity. Anemometer. Angular frequency. Angular momentum. Archimedes' principle. Beattie-Bridgeman equation. Bending moment. Bernoulli's theorem. Borda mouthpiece. Boundary-layer flow. Boyle's law. Brittleness. Buoyancy. Cavitation. Center of gravity. Center of mass. Center

of pressure. Centrifugal force. Centripetal force. Centrode. Centroids of areas and lines. Channel, open. Charles' law. Collision. Compressible flow. Conservation of energy. Conservation of momentum. Constraint. Couple. Crane hook. Creep of materials. Crocco's equation. Curved bars. D'Alembert's paradox. Dalton's law. Degree of freedom (mechanics). Diffuser. Dimensional analysis. Dimensions (mechanics). Displacement (mechanics). Doublet flow. Ducted flow. Dynamic similarity. Dynamics. Efficiency. Elastic limit. Elasticity. Energy. Equilibrium of forces. Euler's momentum theorem. Flight dynamics. Flight science. Flow of fluids. Flow measurement. Fluid dynamics. Fluid mechanics. Fluid statics. Fluid flow principles. Fluid-flow properties. Flutter, aeronautical. Force. Friction. Froude number. Gas dynamics. Gas kinematics. Gas kinetics. Gas mechanics. Hardness scales. Harmonic motion. High-pressure physics. Hooke's law. Horsepower. Hydraulic analog table. Hydraulic gradient. Hydraulic jump. Hydraulics. Hydrodynamics. Hydrokinematics. Hydrokinetics. Hydromechanics. Hydrostatics. Hypersonic flight. Impact (impulsive force). Impulse (mechanics). Incompressible flow. Inertia. Isentropic flow. Jet flow. Karman vortex street. Kelvin's circulation theorem. Kelvin's minimum-energy theorem. Kinematics. Kinetics (classical mechanics). Knudsen number. Laminar flow. Laplace's irrotational motion. Loading, transverse. Loads, dynamic. Loads, repeated. Mach number. Mechanical advantage. Mechanics. Mechanics, classical. Metal, mechanical properties of. Mode of vibration. Model theory. Moment of inertia. Momentum. Motion. Motion, rectilinear. Navier-Stokes equations. Newton's laws of motion. Newtonian fluid. Nozzle. Nutation (astronomy and mechanics). Orifice. Oscillation. Pascal's law. Pendulum. Periodic motion. Pipe flow. Pitot tube. Plastic deformation of metal. Plasticity. Plate, structural. Power. Pressure vessel. Prandtl-Meyer expansion fan. Precession. Pressure. Product of inertia. Radius of gyration. Relative motion. Resilience. Resonance (acoustics and mechanics). Resultant of forces. Reynolds number. Rheology. Rigid-body dynamics. Ring. Ripple tank. Riveted joint. Rotational motion. Rudder, aircraft. Safety factor. Schlieren photography. Shadowgraph of fluid flow. Shear. Shear center. Shock isolation. Shock wave. Shock-wave display. Similitude. Sink flow. Skin friction. Sonic barrier. Sonic boom. Source flow. Statics. Statics in space. Stokes stream function. Strain. Strain gage. Strain rosette. Streamline flow. Streamlining. Strength of materials. Stress and strain. Stress concentration. Super-aerodynamics. Supersonic diffuser. Supersonic flight. Sympathetic vibration. Thermal stress. Throttled flow. Torque. Torricelli's theorem. Torsion. Towing tank. Turbulent flow. Velocity. Venturi tube. Vibration. Vibration damping. Vibration isolation. Vibration machine. Vibration pickup. Viscous flow. Vortex. Wake flow. Water hammer.

Water tunnel. Wave motion in fluids. Wave motion in liquids. Wind tunnel. Wind-tunnel instrumentation. Wood physics. Work. Young's modulus.

## Evolution

Animal evolution. Cambrian. Carboniferous. Cenozoic. Cretaceous. Devonian. Eocene. Evolution, organic. Jurassic. Life, origin of. Macroevolution. Mesozoic. Miocene. Mississippian. Mutation (ontogeny). Oligocene. Ordovician. Paleocene. Paleozoic. Pennsylvanian. Permian. Plant evolution. Pleistocene. Pliocene. Population genetics. Quaternary. Recent. Silurian. Speciation. Tertiary. Triassic.

For specific groups of invertebrate animals *see* INVERTEBRATE ZOOLOGY; for further aspects of plant evolution *see* PALAEOBOTANY; for further aspects of animal evolution *see* PALEONTOLOGY; for specific groups of animals *see* VERTEBRATE ZOOLOGY. *See also* ANTHROPOLOGY.

## Flight science

For aircraft design *see* AERONAUTICAL ENGINEERING. For theoretical aspects of air flow phenomena *see* FLUID MECHANICS. *See also* THERMODYNAMICS.

## Fluid mechanics

Adiabatic process. Aerodynamic center. Aerodynamic force. Aerodynamic wave drag. Aerodynamics. Aeromechanics. Aeronautical engineering. Aerostatics. Aerothermodynamics. Air pocket. Airfoil. Airfoil profile. Air-velocity measurement. Anemometer. Archimedes' principle. Aspect ratio. Beattie-Bridgeman equation. Bernoulli's theorem. Borda mouthpiece. Boundary-layer flow. Boyle's law. Buoyancy. Cavitation. Channel, open. Charles' law. Chemical engineering. Compressible flow. Conservation of energy. Crocco's equation. D'Alembert's paradox. Dalton's law. Diffuser. Doublet flow. Ducted flow. Dynamic similarity. Electrolytic tank. Elevator, aircraft. Euler's momentum theorem. Flight. Flight dynamics. Flow of fluids. Flow measurement. Fluid dynamics. Fluid mechanics. Fluid statics. Fluid-flow principles. Fluid-flow properties. Flutter, aeronautical. Froude number. Gas dynamics. Gas kinematics. Gas kinetics. Gas mechanics. High-pressure physics. Hydraulic analog table. Hydraulic gradient. Hydraulic jump. Hydraulics. Hydrodynamics. Hydrokinematics. Hydrokinetics. Hydromechanics. Hydrostatics. Incompressible flow. Isentropic flow. Jet flow. Karman vortex street. Kelvin's circulation theorem. Kelvin's minimum energy theorem. Knudsen number. Laminar flow. Laplace's irrotational motion. Mach number. Model theory. Navier-Stokes equation. Newtonian fluid. Nozzle.

Ocean currents. Ocean waves. Orifice. Pascal's law. Pipe flow. Pitot tube. Potentials (physics). Prandtl-Meyer expansion fan. Pressure. Pressure measurement. Propeller, air. Reynolds number. Rheology. Ripple tank. Rudder, aircraft. Schlieren

photography. Seiche. Shadowgraph of fluid flow. Shock wave. Shock-wave display. Similitude. Sink flow. Skin friction. Sonic barrier. Sonic boom. Source flow. Stabilizer. Standing wave. Stationary wave. Stokes stream function. Streamline flow. Streamlining. Subsonic flight. Superaerodynamics. Supersonic flight. Supersonic diffuser. Throttled flow. Torricelli's theorem. Towing tank. Turbulent flow. Venturi tube. Viscous flow. Vortex. Wake flow. Water hammer. Water tunnel. Wave (capillary). Wave (internal). Wave motion in fluids. Wave motion in liquids. Wind tunnel. Wind-tunnel instrumentation. Wing. Work.

## Food engineering

Agar. Arrowroot starch. Baking powder. Barley. Buckwheat. Butter. Casein. Cereal chemistry. Charcoal. Cheese. Cliche. Citrus flavoring. Cocoa powder and chocolate. Coffee. Corn. Egg processing. Fat and oil, edible. Filtration. Food. Food engineering. Food manufacturing. Food microbiology. Food poisoning. Food preservation. Food science. Food spoilage. Food technology. Gelatin. Gum. Heat exchanger. Ice cream. Margarine. Milk. Mixing. Monosodium glutamate. Oats. Peanut. Pepsin. Radioactivity (applications). Rennin. Rice. Rye. Salt (food). Sedimentation (industrial). Size reduction. Soybean. Spice and flavoring. Starch. Sugar. Tea. Unit operations. Unit processes. Vanilla extract. Wheat.

For many aspects of food production see AGRICULTURE.

## Forestry

Arborvitae. Ash. Balsa. Basswood. Beech. Birch. Buckeye. Cedar. Cherry. Cherry, wild black. Chestnut. Cypress. Dendrology. Dogwood. Douglas-fir. Ebony. Elm. Fir. Forest and forestry. Forest conservation. Forest ecology. Forest fire control. Forest mapping. Forest mensuration. Forest seeding and planting. Forest soil. Forest tree nursery management. Forestry, farm. Hackberry. Hemlock. Hickory. Holly. Hophornbeam. Hornbeam. Ironwood. Kentucky coffeetree. Larch. Lignumvitae. Locust (forestry). Logging (forestry). Lumber manufacture. Magnolia. Mahogany. Maple. Mulberry. Oak. Osage-orange. Pine. Plywood. Poplar. Red alder. Redwood. Sassafras. Sequoia. Silviculture. Sourwood. Spruce. Sweetgum. Sycamore. Tree. Tulip tree. Tupelo. Veneer. Walnut. Willow. Wood (anatomy and identification). Wood fiber products. Wood finishing. Wood physics. Wood preservation. Woodworking. Yew.

For economic aspects see CONSERVATION; for structure, environmental and classificatory aspects see PLANT ANATOMY; PLANT ECOLOGY; PLANT TAXONOMY.

## General physiology

Bioelectric model. Biological effects of sound waves. Biopotentials and electrophysiology. Cell

(biological). Cell (pressure-temperature effects). Cell membranes and monolayers. Cell-surface ionization. Cytochemistry. Cytology (molecular basis). Electrophysiology (heart). Energy metabolism. Infrared radiation (biology). Mechanoreceptors. Molecular biophysics. Neurophysiology. Nuclear radiation (biology). Radiation biochemistry. Radiation cytology. Radiation microbiology.

For many chemical and physical aspects of physiology see BIOCHEMISTRY; BIOPHYSICS; for those aspects pertaining to cell function see CYTOLOGY; for those aspects pertaining to plants see PLANT PHYSIOLOGY.

See also COMPARATIVE PHYSIOLOGY.

## Genetics

Allele. Bacterial genetics. Biometrics. Breeding (animal). Breeding (plant). Cell division. Chromosome. Chromosome aberration. Chromosome theory of heredity. Cytokinesis. Cytoplasmic inheritance. Deoxyribonucleic acid. Dominance. Recessiveness. blending. Eugenics. Experiment. Expressivity. gene. Gene action. Genetics. Hardy-Weinberg formula. Heterosis. Human genetics. Lethal gene. Linkage, genetic. Maternal influence. Meiosis. Mendelism. Mitosis. Mutation. Penetrance, gene. Phenocopies. Pleiotropism. Polyploidy. Pseudalleles. Recombination, genetic. Ribonucleic acid. Sex determination. Sex-influenced inheritance. Sex-linked inheritance. Syngamy. Transduction, bacterial. Transformation, bacterial.

For information on the chemistry of the physiological processes see BIOCHEMISTRY; for information on the origin of life, animal evolution and plant evolution see EVOLUTION; for those aspects of genetics which apply to microorganism see MICROBIOLOGY.

## Geochemistry

Atmosphere, geochemistry of. Atmospheric chemistry. Biosphere. Biosphere, geochemistry of. Cosmochemistry. Earth (age of). Elements (cosmic abundance). Elements (geochemical distribution). Elements and nuclides (origin). Fused-salt phase equilibria. Geochemical prospecting. Geochemistry. Geochronometry. Geologic thermometry. Geological time scale. High-pressure phenomena. Hydrosphere. Hydrosphere, geochemistry of. Isotope dilution techniques. Lead isotopes, geochemistry of. Life, origin of. Lithosphere. Lithosphere, geochemistry of. Low-level counting. Marine sediments. Metamict state. Meteorite. Ocean currents. Ore deposits, geochemistry of. Paleobiochemistry. Paleocology (geochemical aspects). Petroleum (origin). Radioactive fallout. Radioactive minerals. Radioactive species produced by cosmic rays. Radioactive waste disposal. Radiocarbon dating. Rock (age determination). Silicate phase equilibria. Sulfide phase equilibria. Tektite. Terrestrial nuclear reactions. Tracer, radioactive.

For techniques and methods related to Geo-

chemistry *see* ANALYTICAL CHEMISTRY; ATOMIC PHYSICS; ELECTROMAGNETIC RADIATION; MOLECULAR PHYSICS; NUCLEAR ENGINEERING; NUCLEAR PHYSICS; PHYSICAL CHEMISTRY.

## **Geography**

*See* PHYSICAL GEOGRAPHY.

## **Geology (mineralogy and petrology)**

Agate. Albite. Allanite. Alunite. Amber. Amblygonite. Amethyst. Amphibole. Amphibolite. Analcime. Andalusite. Andesine. Andesite. Anglesite. Anhydrite. Ankerite. Anorthite. Anorthoclase. Anorthosite. Anthophyllite. Apatite. Aphanite. Aplite. Apophyllite. Aragonite. Arenaceous rocks. Argentite. Argillaceous rocks. Argillite. Argyrodite. Arkose. Arsenolite. Arsenopyrite. Asbestos. Augite. Aureole. contact. Azurite. Baddeleyite. Barite. Basalt. Bauxite. Bentonite. Beryl. Beryllonite. Biotite. Boracite. Borate minerals. Bornite. Bournonite. Breccia. Brochantite. Brucite. Bytownite. Calcarenite. Calcite. Caliche. Cameo. Cancrinite. Carat. Carbonate minerals. Carnotite. Cassiterite. Celestite. Cerargyrite. Cerussite. Chabazite. Chalcantite. Chalcedony. Chalcoite. Chalcopyrite. Chalk. Chert. Chlorite. Chloritoid. Chromite. Chrysoberyl. Chrysocolla. Cinnabar. Clay. Clay, commercial. Clay minerals. Coal. Cobaltite. Columbite. Concretion. Conglomerate. Coquina. Cordierite. Corundum. Covellite. Crocoite. Crvolute. Crystal growth. Crystal optics. Crystal structure. Crystallography. Cumingtonite. Cuprite. Dacite. Datolite. Diabase. Diamond. Diatomaceous earth. Diopside. Diorite. Dolomite. Dolomite rock. Dumortierite. Dunite. Eclogite. Emerald. Emery. Enargite. Enstatite. Epidiorite. Epidote. Epidote, Epsomite. Feldspar. Feldspathoid. Felsite. Ferberite. Flaser rock. Fluorite. Frankinite. Fuller's earth. Gabbro. Galena. Garnet. Garnierite. Gem. Gem. manufactured. Gem cutting. Gem mounting. Gemology. Geode. Glauconite. Glaucofane. Gneiss. Goethite. Granite. Granitization. Granodiorite. Granulite. Gravel. Graywacke. Greenockite. Greisen. Gypsum. Halloysite. Halogen minerals. Hausmannite. Heavy minerals. Hematite. Hemimorphite. Heulandite. Hornblende. Hornfels. Huebnerite. Humite. Huntite. Idocrase. Igneous rocks. Illite. Ilmenite. Index mineral. Intaglio (gemology). Jade. Jadeite. Jasper. Jet (gemology). Kaliophilite. Kalsilite. Kaolinite. Kernite. Kutnahorite. Kyanite. Labradorite. Lamprophyre. Larnite. Laterite. Latite. Lava. Lazurite. Lepidolite. Leucite. Leucite rock. Lignite. Limburgite. Limestone. Limonite.

Magma. Magnesite. Magnetite. Malachite. Manganeite. Marble. Marcasite. Marl. Melanterite. Melilite. Merwinite. Metamict state. Metamorphic rocks. Metamorphism. Metasomatism. Mica. Mica schist. Microcline. Migmatite. Millerite. Mineral. Mineral fuel areas. Mineral resource areas. Mineral resources conservation. Mineralogy. Molybdenite. Monazite. Montmorillonite. Monzonite. Moraine.

Muscovite. Mylonite. Native elements. Natrolite. Nepheline syenite. Nephelinite. Niccolite. Niter. Nitrate minerals. Obsidian. Oligoclase. Olivine. Onyx. Oolite and psiolite. Opal. Ore and mineral deposits. Orpiment. Orthoclase. Orthoquartzite. Orthorhombic pyroxene. Pearl. Peat. Pectolite. Pegmatite. Pentlandite. Peridotite. Perlite. Perovskite. Perthite. Petrographic province. Petrography. Petrology. Phenocryst. Phlogopite. Phonolite. Phyllite. Phyllonite. Picrite. Pigeonite. Pitchstone. Pleochroic halos. Pneumatolysis. Pollucite. Porphyroblast. Porphyry. Precious stones. Prehnite. Proustite. Psilomelane. Pumice. Pyrrargyrite. Pyrite. Pyroclastic rocks. Pyrolusite. Pyromorphite. Pyroxene. Pyroxenite. Pyrrhotite.

Quartz. Quartzite. Radioactive minerals. Radiolarian earth. Rapakivi granites. Realgar. Rhodochrosite. Rhodonite. Rhyolite. Rock. Rock salt. Rubellite. Ruby. Rutile. Sandstone. Sanidine. Sapphire. Scapolite. Scheelite. Schist. Sedimentary rocks. Sepiolite. Serpentine. Serpentinite. Shale. Siderite. Silicate minerals. Siliceous sinter. Sillimanite. Skarn. Skutterudite. Slate. Smithsonite. Soapstone. Soda niter. Sodalite. Sperryllite. Sphalerite. Spinel. Spinel. Spodumene. Stalactites and stalagmites. Staurolite. Stibnite. Stilbite. Stone and stone products. Strontianite. Stylolites. Subgraywacke. Syenite. Taconite. Talc. Tantalite. Tetrahedrite. Thermalite. Thorianite. Thorite. Tonalite. Topaz. Tourmaline. Trachyte. Travertine. Tremolite. Tufa. Tuff. Turquoise. Uraninite. Vermiculite. Vivianite. Volcanic glass. Wavellite. Willemite. Witherite. Wolframite. Wollastonite. Wulfenite. Wurtzite. X-ray powder method. Xenolith. Zeolite. Zincite. Zircon.

For additional treatment of ore and mineral deposits and geochemical processes *see* GEMOLOGY. For additional treatment of crystalline materials *see* SOLID-STATE PHYSICS. For engineering aspects *see* ENGINEERING GEOLOGY. For surficial and historic aspects *see* GEOLOGY (SURFICIAL AND HISTORICAL).

## **Geology (surficial and historical)**

Albertite. Amygdale. Anticline. Archeozoic. Asphalt and asphaltite. Atoll. Authigenic minerals. Avalanche. Barrier reef. Basement rock. Batholith. Bioherm. Biostrome. Bitumen. Black shale. Cambrian. Carboniferous. Cave. Cenozoic. Cirque. Cleavage. rock. Coastal landforms. Coastal plain. Continental shelf and slope. Coral reef. Cretaceous. Cyclothem.

Darcy. Dating methods. Delta. Desert erosion features. Devonian. Diagenesis. Diapiric structures. Diastem. Diastrophism. Dopplerite. Drumlin. Dune. Earthquake. Elaterite. Engineering geology. Eocene. Erosion. Escarpment. Esker. Evaporite (saline). Exfoliation. rock. Facies (geology). Fall line. Fault and fault structures. Finger lakes. Fiord. Flood plains. Fluvial erosion cycle. Fluvial erosion landforms. Fold and fold systems. Fringing

reef. Frost action. Geology. Geomorphology. Geosyncline. Gilsonite. Glacial Epoch. Glaciated terrane. Graben. Hatchettite. Horst. Impsonite. Joint (geology). Jurassic.

Kame. Karst topography. Kerogen. Laccolith. Landslide. Loess. Marine sediments. Mass wasting. Massif. Matterhorn. Mesozoic. Miocene. Mississippian. Mud volcano. Natural gas. Oceanic islands. Oil sand. Oil shale. Oil-field waters. Oligocene. Ordovician. Ozokerite. Paleocene. Paleoclimatology. Paleocology. Paleogeography. Paleogeology. Paleosol. Paleozoic. Pennsylvanian. Permian. Petrofabric analysis. Petroleum. Petroleum geology. Playa. Pleistocene. Pliocene. Pluton. Precambrian. Proterozoic. Quaternary. Recent. Redbed. Regolith. Rift valley. Rock mechanics. Salt dome. Sand. Sapropel. Schistosity, rock. Seamount and geyser. Sedimentation (geology). Shore processes. Silurian. Strand line. Stratigraphic nomenclature. Stratigraphy. Stream transport and deposition. Stromatolite. Structural geology. Structural petrology. Submarine canyon. Submarine topography. Syncline. Talus. Tectonic patterns. Tertiary. Till. Torbanite. Triassic. Umin. Unconformity. Varve. Volcano. Weathering processes. Wurtzite.

For the origin, distribution, and abundance of the earth's elements, their geochemical cycles, and absolute methods of geochronology *see* **GEOCHEMISTRY**. For properties of minerals and the petrography and petrogenesis of rocks, mineral and ore deposits, *see* **GEOLOGY (MINERALOGY AND PETROLOGY)**. For geophysical phenomena of the earth, its waters, and its atmosphere *see* **GEOPHYSICS**; **METEOROLOGY AND CLIMATOLOGY**; **OCEANOGRAPHY**. For the development of plants, animals, and man, the lines of descent, and the history of such relationships *see* **ANTHROPOLOGY**; **EVOLUTION**; **PALAEONTOLOGY**; **PALEONTOLOGY**. For an interpretative description of relief features, resources, and the graphic representation of earth features *see* **PHYSICAL GEOGRAPHY**.

## Geophysics

Aeromagnetic surveying. Aeronomy. Air glow. Albedo. Aphelion. Apogee. Aquifer. Artesian systems. Atmospheric electricity. Atmospheric evaporation. Aurora. Cloud physics. Compass, magnetic. Cosmic rays. Declinometer. Earth. Earth (heat flow). Earth (orbital motion). Earth deformations and vibrations. Earth inductor. Earth interior. Earth sciences. Earth tides. Earthquake. Electrojet, upper air. Evapotranspiration. Geodesy. Geologic thermometry. Geomagnetic storm. Geomagnetic variations, transient. Geomagnetism. Geophysical exploration. Geophysics. Geyser. Glacier. Gravitation. Ground water. High-pressure phenomena. Hydrography. Hydrolaccolith. Hydrology. Ice field (Eisstrometz). Inclinator. Ionosphere. Isostasy. Lightning. Magnetometer. Meteorological instrumentation. Meteorological rockets. Meteorological satellites. Mineral spring. Moho (Mohorovičić

discontinuity). Mohole. Orogeny. Perigee. Polar wandering. Polygonal ground. Prospecting. Prospecting, petroleum. Rock magnetism. Seismograph. Seismology. Snow field. Snow gage. Snow line. Snow surveying. Solifluction. Spring (water). Stream gaging. Surface water. Swamp, marsh and bog. Tectonophysics. Terrestrial electricity. Terrestrial force fields. Terrestrial frozen water. Terrestrial gravitation. Terrestrial magnetism. Thermal spring. Tide. Tsunami. Van Allen radiation. Variometer. Volcanology. Warping, earth crust. Water table. Well.

For cosmic-terrestrial relationships and related geophysical and cosmological phenomena *see* **ASTRONOMY**; **GEOCHEMISTRY**; **SPACE TECHNOLOGY**. For a treatment of absolute geochronology and of geochemical processes in the atmosphere, biosphere, hydrosphere, and lithosphere *see* **GEOCHEMISTRY**. For additional information on related geophysical phenomena of the atmosphere and oceans *see* **METEOROLOGY AND CLIMATOLOGY**; **OCEANOGRAPHY**.

## Graphics and graphic arts

Art, science in. Book manufacturing. Composition (type). Descriptive geometry. Dimensioning. Drafting. Drafting machine. Engineering drawing. Engineering graphics. Ink. Layout drawing. Paper and paper products. Photocopying processes. Pictorial drawing. Printing. Printing in color. Printing plate. Printing press. Schematic drawing. Typesetter. Teletypewriter. Type, printing. Wiring diagram.

## Growth and morphogenesis

Adrenal gland. Allantois. Amnion. Androgenesis. Animal. Animal morphogenesis. Aortic body. Blastulation. Cardiovascular system. Carotid body. Cell constancy. Cell lineage. Chorion. Cleavage, embryonic. Coelom. Digestive gland. Digestive system. Ear. Embryogenesis. Embryology. Embryology, experimental. Embryonic differentiation. Embryonic induction. Embryonic organizer. Endocrine gland. Endocrine system. Epidermal ridges. Esophagus. Estrus. Extraembryonic membranes. Eye. Fate maps, embryonic. Feather (bird). Fertilization. Fetal membrane. Fingerprint. Gallbladder. Gametogenesis. Gastrulation. Germ layers. Gland. Gynogenesis. Hair. Hematopoiesis. Histogenesis. Integument. Integumentary patterns. Invertebrate embryology. Kidney. Lacrimal gland. Lip. Liver. Lymphatic system. Mammary gland. Merogony. Metamerism, embryonic. Muscular system. Nervous system. Neural crest. Neurulation. Oogenesis. Oral gland. Ovum. Palate. Pancreas. Parathyroid gland. Pharynx. Photophore gland. Placentation. Plant morphogenesis. Poison gland. Primitive gut. Protogyny. Reproduction, animal. Reproductive system. Respiratory system. Salt gland. Scale (zoology). Scent gland. Sebaceous gland. Sexual dimorphism. Skeletal system. Sperm cell. Sperma-

togenesis. Sweat gland. Swim bladder. Teratogenesis. Thymus gland. Thyroid gland. Tongue. Tooth. Ultimobranchial bodies. Urinary system. Uropygial gland. Yolk sac.

For various animal groups in which certain embryological aspects may be discussed *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

## Heat

Absorption (electromagnetic radiation). Black body. Bolometer. Boltzmann constant. Boltzmann statistics. British thermal unit (Btu). Brownian movement. Calorie. Calorimetry. Chemical fuel. Color temperature. Combustion. Conduction (heat). Conservation of energy. Convection (heat). Dewar flask. Eigenfunction. Emissivity. Energy. Energy sources. Enthalpy. Fire. Flame. Fossil fuel. Fuel. Fuel gas. Fuel gas supplements. Gray body. Heat. Heat balance. Heat capacity. Heat exchanger. Heat radiation. Heat transfer. Ice point. Incandescence. Insulation. Heat. Joule. Kinetic theory of matter. Lattice vibrations. Low-temperature physics. Phonon. Planck's radiation law. Power. Pyrometer. Solar energy. Specific heat. Specific heat of solids. Statistical mechanics. Temperature. Temperature measurement. Thermal expansion. Thermal stress. Thermoanalysis. Thermocouple. Thermodynamic principles. Thermodynamic processes. Thermometer. Turbine propulsion. Work.

*See also* THERMODYNAMICS.

## Histology

Adipose tissue. Blood. Bone. Cardiovascular system. Cartilage. Connective tissue. Digestive system. Epithelium. Histology. Lymphatic system. Muscle. Muscular system. Nerve. Nervous system. Reproductive system. Respiratory system. Skeletal system. Tissue. Urinary system.

For specific animal groups *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

## Hydrology

Agriculture (drainage). Aquifer. Artesian systems. Atmospheric evaporation. Basin. Canal. Cave. Channel. open. Cloud physics. Dam. Darcy. Evapotranspiration. Flood plains. Fluvial erosion cycle. Fluvial erosion landforms. Frost action. Geyser. Glacier. Ground water. Hydrography. Hydrolaccolith. Hydrology. Hydrometeorology. Hydrosphere. Hydrosphere, geochemistry of. Ice field (Eisstromnetz). Irrigation of crops. Karst topography. Lake. Limnology. Meteorological instrumentation. Mineral spring.

Oasis. Permafrost. Plant, water relations of. Playa. Polygonal ground. Precipitation (meteorology). Precipitation gages. Reservoir. River. River engineering. River tides. Sedimentation (geology). Sewage disposal. Snow. Snow field. Snow gage. Snow line. Snow surveying. Soil. Soil conservation. Soil mechanics. Solifluction. Spring (water). Stream gaging. Stream transport and deposition. Surface

water. Swamp, marsh, and bog. Terrestrial frozen water. Thermal spring. Tree-ring hydrology. Water. Water analysis. Water conservation. Water microbiology. Water pollution. Water power. Water supply engineering. Water table. Well.

*See also* FLUID MECHANICS; METEOROLOGY AND CLIMATOLOGY; OCEANOGRAPHY.

## Illumination engineering

*See* ELECTRICAL ENGINEERING.

## Immunology

Ablastin. Agglutination reaction. Agglutinin. Allergy. atopic. Antibody. Antigen. Antigen-antibody reaction. Antitoxin. Arthus reaction. Blood groups. Complement (serum). Complement-fixation test. Conglutination. Germfree vertebrate. Hypersensitivity. Immunity. Immunological tolerance, acquired. Immunology. Lysin. Latic reaction. Neutralization reaction (antibody). Neutralizing antibody. Serology. Skin test.

## Industrial and production engineering

Allowance. Assembly methods. Automation. Bulk-handling machines. Caliper. Comparator. Control chart. Conveying machines. Conveyor. Crane hoist. Derrick. Design standards. Dimensioning. Drafting machines. Elevating machines. Engineering. Engineering and architectural contracts. Environmental test. Escalator. Force fit. Gages. Gantt chart. Hoisting machines. Industrial control. Industrial engineering. Industrial trucks. Inspection and testing. Inventory management. Jig, fixture, and die design. Linear programming. Location fit. Mass production. Materials handling. Materials handling machines. Methods engineering. Methods study. Micrometer. Miniaturization of equipment. Monorail. Nomograph. Operations research. Operator training. Optical flat. Packaging of equipment. Patent. Pilot production. Plant facilities. Press fit. Product design. Production engineering. Production methods. Production planning. Prototype (equipment). Qualification test. Quality control. Reliability of equipment. Running fit. Shrink fit. Technology. Tolerance. Wage incentives. Work measurement. Work standardization.

For industrial psychology and human engineering *see* PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL. For industrial and production equipment, techniques, and materials, *see* the various engineering lists such as CIVIL ENGINEERING; CONTROL SYSTEMS; ELECTRICAL ENGINEERING; MECHANICAL ENGINEERING.

## Industrial microbiology

Acetobacter suboxydans fermentation. Acetone-butanol fermentation. Acetone-ethanol fermentation. Amphotericin B. Antibiotic. Bacitracin. Bacteria. Bacterial genetics. Bacterial metabolism. Bacterial nutrition. Bacterial physiology. Bioassay. 2,3-Butanediol. Butter. Carbomycin. Cheese. Chlor-



amphenicol. Chlortetracycline. Citric acid. Culture, elective. Culture, media components of. Culture, pure. Culture technique. Cycloserine. Demethylchlortetracycline. Dextran. Distilled spirits. Enzyme (industrial production). Epoxysuccinic acid. Erythromycin. Food preservation. Fumaric acid. Gallic acid. Gram's stain. Griseofulvin. Industrial microbiology. Itaconic acid. Itatartaric acid. Kanamycin. Kojic acid. Lactic acid. Lactobacillaceae. Lyophilization. Malt beverage. Microbiological methods. Microbiology. Mushroom. Neomycin. Novobiocin. Nystatin. Oxytetracycline. Penicillin. Polymyxin. Saccharomycetales. Sterilization. Streptomycetaceae. Streptomycin. Subtilin. Tetracycline. Textile microbiology. Viomycin. Wine. Yeast, industrial.

## Inorganic chemistry

Acid and base. Acidolysis. Actinide elements. Actinium. Activated carbon. Alkali. Alkali metals. Alkaline-earth metals. Alum. Aluminate. Aluminum. Amalgam. Americium. Amidine. Ammine. Ammonia. Ammonium salt. Antimonate. Antimony. Aqua regia. Argon. Arsenate. Arsenic. Arsenite (chemical). Astatine. Atmospheric gases, production of. Azide. Barium. Barium titanate. Base, chemical. Benzoate. Berkelium. Beryllium. Bismuth. Borane. Borate. Boride. Boron. Bromate. Bromide. Bromine. Cadmium. Calamine. Calcium. Californium. Calomel. Carbide. Carbon. Carbon dioxide. Carbonate. Cement. Cerium. Cesium. Chemical compounds. Chemical structures. Chemical symbols and formulas. Chlorate. Chloride. Chlorine. Chloroplatinate. Chromate. Chromium. Citrate. Clathrate compounds. Cobalt. Combining volumes, law of. Complex compounds. Concrete. Coordination chemistry. Coordination number. Copper. Copper chemistry. Crystal. Crystal growth. Crystal structure. Curium. Cyanamide. Cyanate. Cyanide. Cyanogen. Definite composition, law of. Detergent. Deuterium. Dichromate. Dry ice. Dysprosium. Einsteinium. Electrochemical series. Electrolyte. Electronegativity. Elements (chemical). Equivalent weight. Erbium. Europium. Fermium. Ferric compound. Ferricyanide. Ferrite. Ferrocene. Ferrocyanide. Ferrous compound. Fire. Fluoborate. Fluoride. Fluorine. Fluosilicate. Francium. Fulminate. Gadolinium. Gallium. Germanium. Gold. Gram-equivalent weight. Gram-molecular weight. Graphite. Hafnium. Halide. Halogen elements. Heavy water. Helium. Helium, liquid. Holmium. Hydrate. Hydrazine. Hydride. Hydride, metal. Hydrogen. Hydrogen fluoride. Hydrogen ion. Hydroxide. Hypochlorite. Indium. Inert gases. Inorganic chemistry. Intermetallic compounds. Iodate. Iodide. Iodine. Ion. Iridium. Iron. Krypton. Krypton compounds. Lanthanide contraction. Lanthanum. Lawrencium. Lead. Lead isotopes, geochemistry of. Liquefaction of gases. Lithium. Luteum. Magnesium. Magnetochemistry. Manganese. Manganese compound. Match. Mendeleevium. Mer-

cury (element). Metal carbonyl. Metalloacid elements. Metalloid. Mixture. Molybdate. Molybdenum. Mordant. Multiple proportions, law of. Neodymium. Neon. Neptunium. Nickel. Niobium. Nitrate. Nitric acid. Nitride. Nitrite. Nitrogen. Nitrogen oxides. Nobelium. Nonelectrolyte. Nonmetal. Nonstoichiometric compounds. Nuclear chemistry. Osmium. Oxalate. Oxidation-reduction. Oxide. Oxidizing agent. Oxygen. Ozone. Palladium. Parachor. Perchlorate. Periodate. Periodic table. Permanganate. Peroxide. Persulfate. pH. Phosphate. Phosphorus. Platinum. Plutonium. Polonium. Polymer, inorganic. Portland cement. Potassium. Praseodymium. Promethium. Protactinium. Radiochemistry. Radioisotope production. Radium. Radon. Rare-earth elements. Rhenium. Rhodium. Rubidium. Ruthenium. Salt (chemical). Samarium. Scandium. Selenium. Silicate. Silicon. Silver. Sodium. Solid-state chemistry. Solvent. Strontium. Sulfate. Sulfide. Sulfite. Sulfur. Sulfuric acid. Tantalum. Technetium. Tellurium. Terbium. Thallium. Thiocyanate. Thiosulfate. Thorium. Thulium. Tin. Titanate. Transition elements. Transmutation. Transuranium elements. Trifluoroacetate. Tritium. Tungstate. Tungsten. Uranium. Vanadate. Vanadium. Water. Xenon. Xenon compounds. Ytterbium. Yttrium. Zinc. Zincate. Zirconium.

For the application of inorganic materials of construction see CIVIL ENGINEERING. For the earth sciences aspects of ores and minerals from which metals are won see GEOLOGY (MINERALOGY AND PETROLOGY). For the practical applications of metals and other inorganics see MECHANICAL ENGINEERING. For the field of carbon-silicon chemistry and organic metallic compounds see ORGANIC CHEMISTRY. For the measurement and determination of inorganic chemical constants see PHYSICAL CHEMISTRY.

## Invertebrate zoology

Abalone. Acanthocephala. Acarina. Acanthosporidea. Acoela. Acoelomata. Acrania. Acrothoracica. Actiniaria. Actinomysidia. Actinopoda. Adcleida. Aleyoacea. Aleyonaria. Allococcolia. Ambergris. Amblypygi. Ameba. Amra. Ammonidea. Amoebozoa. Amphidiscophora. Amphidiscosa. Amphiliidea. Amphineura. Amphipoda. Anaspidacea. Animal. Animal symmetry. Anisomyaria. Annelida. Anopla. Anoplura. Anostraca. Ant. Ant lion. Anthozoa. Anthuridea. Antimere. Antipatharia. Aphelerochoidea. Aphid. Aplousophora. Apoda. Apodacea. Apodida. Aporidae. Apostomatida. Apterygota. Arachnida. Araneae. Arbacioidea. Archiacanthocephala. Archiannelida. Arguloida. Arhynchobdellae. Army worm. Arthropoda. Articulata (Brachiopoda). Articulata (Echinodermata). Ascaridida. Ascaridina. Ascaridoidea. Ascaris. Aschelminthes. Ascidiacea. Ascothoracica. Asellota. Aspidobranchia. Aspidochiroptera. Aspidochirotrida. Aspidogastrea. Asteroidea. Asterozoa. Astomatida. Athecanephria. Atremata. Aulodonta. Autotomy. Axono-

laimoidea. Balanomorpha. Barnacle. Bathynellacea. Bdelloidea. Bdelomorpha. Bedbug. Beetle. Belemnoidea. Beroida. Bilateria. Blastoidea. Borer. Boring sponges. Bothriocidaroida. Brachiata. Brachiopoda. Branchiopoda. Branchiura. Brittle star. Bryozoa. Bug. Butterfly. Caddis fly. Calanoida. Calcareo. Calcaronea. Calcinea. Caligoida. Camarodonta. Camerata. Cankerworm. Caprellidea. Carpoidea. Cassiduloida. Caterpillar. Centipede. Cephalobaenida. Cephalocarida. Cephalochordata. Cephalopoda. Ceractinomorpha. Cercaria. Ceriantheria. Cestida. Cestoda. Cestodaria. Cestoidea. Chaetognatha. Chaetonotoidea. Cheilostomata. Chelicerata. Chigger. Chilopoda. Chinch bug. Chloromonadida. Chonotrichida. Chori-stida. Chromadoroidea. Chrysomonadida. Cidaroida. Ciliata. Ciliophora. Cirripedia. Cladoceia. Cladocopa. Clam. Clathrinida. Clavaxinellida. Clypeasteroidea. Cnidosporidia. Corcidia. Cockle. Cockroach. Coelenterata. Coelothecalia. Coenurosis. Coleoidea. Coleoptera. Collembola. Conch. Conchostraca. Copepoda. Coral. Corallimorpharia. Coronatae. Crab. Crayfish. Cricket. Crinoidea. Crinozoa. Crustacea. Cryptomonadida. Cryptostomata. Ctenophora. Ctenostomata. Cubomedusae. Cumacea. Cutworm. Cyclophyllidea. Cyclopoida. Cyclostomata (Bryozoa). Cydippidea. Cysticercosis. Cystoidea. Dactylochirotida. Decapoda (Crustacea). Decapoda (Mollusca). Demospongiae. Dendroceratida. Dendrochirotacea. Dendrochirotida. Dermaptera. Desmodoroidea. Desmoscolecoida. Deuterostomia. Diadematacea. Diademataida. Dibranchia. Dictyoceratida. Dicyemida. Digenea. Dinoflagellida. Diotophymoidea. Diphyllidea. Diplopoda. Diploporita. Diplura. Diptera. Dorylaimoidea. Dracunculoidea. Dragonfly. Earthworm. Earwig. Echinacea. Echinococcosis. Echinocystitoida. Echinodermata. Echinoida. Echinoidea. Echinothurioida. Echinozoa. Echiurida. Edrioasteroidea. Eimeriida. Elapsodida. Eleutherozoa. Embioptera. Endopterygota. Enopla. Enoploidea. Enterocoela. Enteropneusta. Enterozoa. Entodiniomorphida. Entomology. Entomology, economic. Entoprocta. Eocanthocephala. Eocrinoida. Ephemeroptera. Epicaridea. Eucarida. Eucestoda. Eucelomata. Euechinoida. Euglena. Euglenida. Eugregarinida. Eulamellibranchia. Eumalacostraca. Eumetazoa. Euphausiacea. Eutardi-grada. Exopterygota. Filarioida. Firefly. Flabellifera. Flea. Flexibilia. Fly. Foraminiferida. Forcipulata.

Gammaridea. Gastropoda. Gastrotricha. Gnathioidea. Gordioidea. Gorgonacea. Grasshopper. Gregarinida. Gymnolaemata. Gymnostomatida. Gyrocotylidea. Haemosporidida. Hairworm. Halichondrida. Haplosclerida. Haplosporidia. Harpacticoida. Helicoplacoida. Helicosporida. Heliozoidea. Hellgrammite. Hemichordata. Hemiecidaroida. Hemidiscoa. Hemimetabola. Hemiptera. Hemizonida. Heterochlorida. Heteronemertini. Heterotardigrada. Heterotrichida. Hexactinellida. Hexactinosa. Hexapoda. Hexasterophora. Hirudinea.

Holasteroidea. Holoctypoida. Holometabola. Holothuroidea. Holotricha. Homaloboa. Homoptera. Homosclerophorida. Hoplocarida. Hoplonemertini. Hornet. Hydra. Hydroidea. Hydrozoa. Hymenoptera. Hymenostomatida. Hyperidea. Hypermastigida. Hypotrichida. Ichneumon. Inadunata. Inarticulata. Insect control, biological. Insect pathology. Insecta. Invertebrata. Invertebrate embryology. Irregularia. Isopoda. Isoptera. Ixodides. Jellyfish. Katydid. Kinorhyncha. Kissing bug. Lancelot. Larvacea. Leaf hopper. Lecanicephaloidea. Leech. Lepadomorpha. Lepidocentroida. Lepidoptera. Leptostraca. Lernaepodoida. Leucetida. Leucosoleniida. Limpet. Lipostraca. Lobata. Lobster. Lophophora. Louse. Lychniscosa. Lyssacinosa. Macrodasypoidea. Malacostraca. Mallophaga. Mandibulata. Mantis. Mastigophora. Mayfly. Mealybug. Mecoptera. Mermithoidea. Mesostigmata. Mesozoa. Metagenesis. Metamerism. Metazoa. Microsporidia. Microtechnique. Midge. Milleporina. Millipede. Mite. Mollusca. Molpadida. Monhysteroidea. Monogenea. Monogononta. Monstrilloida. Moruloidea. Mosquito. Moth. Mussel. Mycetozoida. Myiasis. Myodocopa. Myriapoda. Mysidacea. Mystacocarida. Myxosporidia. Nautiloidea. Nautilus. Nebaliacea. Nectonematoidea. Nematoda. Nematomorpha. Neogastropoda. Neoteny. Neotremata. Neuroptera. Nippotaeniidea. Notodelphyzoidea. Notomysotina. Notostraca. Nucleolitoidea. Nuda. Nudibranch. Nudibranchia.

Obelia. Octopoda. Octopus. Odonata. Odonotomatida. Oegophiurida. Oligochaeta. Oligomera. Oligotrichida. Oniscoidea. Onychopalpida. Onychophora. Ophiocystoidea. Ophiurac. Ophiuroidea. Opisthobranchia. Orthocentrida. Orthopneusta. Ostracoda. Oxyurina. Oxyuroidea. Oyster. Oyster drill. Paedogenesis. Palaeacanthocephala. Palaeochinoidea. Palaeoisopus. Palaeonemertini. Palaeotremata. Paleocopa. Palpigradi. Pancaria. Paracrinoida. Paramecium. Parasitic castration. Parasitology. Parazoa. Parthenogenesis. Pauropoda. Paxillosina. Pectinibranchia. Pedipalpi. Pelecypoda. Pelmatozoa. Pennatulacea. Pentastomida. Petacarida. Perischoechinoidea. Peritrichida. Periwinkle. Phalangida. Phanerozoona. Pharetronida. Phoronida. Phreaticoidea. Phrynophiurida. Phylactolaemata. Phyllocarida. Phymosomatoida. Phytomastigophorea. Phytomonadida. Pinworm. Plasmodroma. Platyasterida. Platycopa. Platytenca. Platyhelminthes. Plecoptera. Plectoidea. Podocopa. Poecilosclerida. Poecilioidea. Pogonophora. Polychaeta. Polycladida. Polymastigida. Polymera. Polyplacophora. Porifera. Poroccephalida. Portuguese man-of-war. Priapulida. Prosobranchia. Protandry. Proteocephaloidea. Proteomysida. Proterostomia. Protobranchia. Protomastigida. Protozoa. Protozoology. Protremata. Protura. Pseudocoelomata. Pseudophyllidea. Pseudoscorpionida. Psocoptera. Pterobranchia. Pterygota. Ptychodactylaria. Pulmonata. Pycnogonida.

Pygasteroidea. Radiata. Radiolarida. Regularia. Reticulosa. Rhabdiasoidea. Rhabditoidea. Rhabdo-coela. Rhizocephala. Rhizomastigida. Rhizopodea. Rhizostomeae. Rhombifera. Rhynchobdellae. Rhyn-chocoela. Ricinulei. Rock shell. Rotifera. Salenoida. Sand dollar. Sarcodina. Sarcophthiformes. Sarcosporidia. Scale insect. Scallop. Scaphopoda. Schizo-coela. Schizogregarinida. Scleractinia. Scorpion. Scorpionida. Scyphozoa. Sea cucumber. Sea fan. Sea squirt. Sea urchin. Seasonaria. Semacostomaeae. Sepioidea. Septibranchia. Shipworm. Shrimp. Sil-verfish. Siphonaptera. Siphonophora. Sipuncu-loidea. Slug (zoology). Snail. Solpugida. Somas-teroidea. Sow bug. Sparganosis. Spatangoida. Spelaeogriphacea. Spider. Spinuloida. Spirotricha. Spiruroidea. Spittle insect. Sponge. Sporozoa. Springtail. Squash bug. Starfish. Statoblasts. Stauro-medusae. Stenolaemata. Stenurida. Stirodonta. Stolonifera. Stomatopoda. Stone fly. Strongy-loidea. Stylasterina. Suctorida. Syctetida. Sym-phyla. Syncarida. Tanaidacea. Tapeworm. Tardigrada. Tarnished plant bug. Taxodonta. Tec-tibranchia. Telestacea. Telosporidea. Telotrema. Temnopleuroidea. Tentaculata. Termite. Testacida. Tetrabranchia. Tetractinomorpha. Tetraphyllidea. Teuthoidea. Thaliacea. Thecanephria. Thermos-baenacea. Thigmotrichida. Thoracica. Thrip. Thy-sanoptera. Thysanura. Tick. Tintinnida. Tooth-shell. Tortoise. Trachylina. Treehopper. Triema-toda. Trepostomata. Trichomonadida. Trichoptera. Trichostomatida. Trichuroidea. Tricladida. Trilo-bita. Trochophore. Trombidiformes. Trypanorhyn-cha. Trypanosomatidae. Tunicata. Turbellaria. Tylenchoidea. Uropygi. Valvatina. Valvifera. Vam-piromorpha. Verrucomorpha. Walking stick. Wasp. Water boatman. Water bug. Water flea. Water-strider. Weevil. Wheel bug. Wheel. Worm. Xipho-sura. Zootharia. Zoothidea. Zoology. Zoomastig-ophorea. Zoraptera.

For classification see ANIMAL SYSTEMATICS;  
for fossil groups see PALEONTOLOGY.

## Low-temperature physics

See SOLID-STATE PHYSICS.

## Machine design

See MECHANICAL ENGINEERING.

## Marine engineering

See MECHANICAL ENGINEERING; NAVAL ARCHITEC-TURE.

## Mathematics

Addition. Algebra. Analysis of variance. Analytic geometry. Angle. Arc (mathematics). Area. Asymptote. Barycentric calculus. Bessel functions. Beta function. Binary number system. Binomial theorem. Boolean algebra. Calculus, differential and integral. Calculus of tensors. Calculus of variations. Calculus of vectors. Cardioid. Catenary. Centroids of areas and lines. Chord. Circle. Com-

binations and permutations. Complex numbers and complex variables. Cone. Conformal mapping. Conic section. Coordinate systems, graphical. Cube. Curve fitting. Cycloid. Cylinder. Decimal number system. Descriptive geometry. Determinant. Diameter. Differential equation. Differentiation. Dihedron. Discriminant. Distribution (probabil-ity). Division. Dyadic. *e*. Ellipse. Ellipsoid and spheroid. Elliptic function and integral. Epicycloid. Equations, theory of. Exponent. Extrapolation. Fib-er bundle. Fourier series and integrals. Game theory. Gamma function. Gauss' theorem. Geome-try, differential. Geometry, euclidean. Geometry, noneuclidean. Geometry, Riemannian. Gradient of a scalar. Graph theory. Graphic methods. Green's theorem. Group theory. Helix. Hexagon. Hyper-bola. Hyperbolic function. Hyperboloid. Infinity. Information theory. Integral transform. Integra-tion. Interpolation. Involute. Laplace's differential equation. Laplace transform. Laplacian. Lattice (mathematics). Least squares, method of. Lemnis-cate (of Bernoulli). Line. Line integral. Linear programming. Linear systems of equations. Lissa-jous figures. Logarithm. Logic. Lorentz transfor-mations. Manifold (mathematics). Mathematical notation, contemporary. Mathematics. Matrix cal-culus. Matrix theory. Monte Carlo method. Multi-plication. Mosaograph. Normal. Number systems. Number theory. Numerical analysis. Octagon. Octahedron. Octal number system. Operator theory. Orthogonal polynomials. Parabola. Paraboloid. Parallelepipid. Parallelogram. Parameter. Para-metric equation. Partial differentiation. Pentagon. Perturbation (mathematics). Plane. Point. Polar triangle. Polygon. Polyhedron. Polynomial systems of equations. Polytopes, regular. Potentials (mathe-matics). Prism. Prismatoid and prismoid. Probabil-ity. Progression (mathematics). Projective geo-metry. Protractor. Pyramid and frustum. Pythag-orean theorem. Quadric surface. Quadrilateral. Quaternions. Queueing theory. Radian measure. Radius. Real variable. Rectangle. Ring theory. Root (mathematics). Root-mean-square. Rose curve. Sca-lar. Series. Set theory. Significant figure. Slope. Solid (geometric). Sphere. Spherical harmonics. Spheroid. Spiral. Square. Statistics. Stochastic proc-ess. Stokes' theorem. Subtraction. Surface and solid of revolution. Tangent. Tensor. Tetrahedron. Theo-rem. Topology. Torus. Tractrix. Trapezoid. Trian-gle. Trigonometric curve. Trigonometry, plane. Trigonometry, spherical. Trihedron. Variable (dis-crete and continuous). Vector (mathematics). Zero.

For applications of mathematics to the various scientific and engineering fields see the particular field of interest.

## Mechanical engineering

Acceleration analysis. Accelerometer. Ackerman steering. Air brake. Air compressor. Air condition-ing. Air conditioning, automotive. Air cooling. Air

filter. Allowance. Anharmonic oscillator. Assembly methods. Atomic energy. Automobile. Automotive body. Automotive brake. Automotive chassis. Automotive engine. Automotive frame. Automotive steering. Automotive suspension. Automotive vehicle. Axle. Ball-bearing pulverizer. Bearing, anti-friction. Bell. Belt drive. Block and tackle. Blow-pipe. Boiler feed-water regulation. Boiler water. Bolt. Bolted joint. Boring. Bourdon-spring pressure gage. Brayton cycle. Broaching. Buffing. Buhrstone mill. Bulk-handling machines. Bulldozer. Burning velocity measurement. Bus. Bushing.

Caliper. Cam mechanism. Carburetor. Carnot cycle. Casting. Central heating. Centrifugal pump. Cetane number. Chain drive. Chimney. Classification, mechanical. Clevis pin. Clutch. Coining. Cold storage. Combustion chamber. Combustion knock. Combustion wave measurement. Comfort control. Comparator. Compression ratio. Compressor. Condenser, vapor. Connecting rod. Construction equipment. Contact condenser. Convection (heat). Conveying machines. Conveyor. Cooling tower. Cotter pin. Coupling. Crane hoist. Crane hook. Crank. Crushing and pulverizing. Curved bars. Damping. Degree-day. Dehumidifier. Derrick. Design standards. Diesel cycle. Diesel engine. Differential. Dimensioning. Dimensions (mechanics). Displacement pump. Distributor. Drafting machine. Drawing of metal. Dredge. Drilling machine. Dry ice. Ducted fan. Dynamometer. Earthmover. Economizer and air heater. Efficiency. Electric furnace. Electric-discharge machining. Electromagnetic pump. Electroplating of metals. Electropolishing. Elevating machines. Energy conversion. Energy sources. Engine. Engine cooling. Escalator. Escape-ment. Excavator. Explosive forming. Extrusion. Fan. Feed water. Fire-tube boiler. Fluid coupling. Flywheel. Force fit. Forging. Fossil fuel. Four-bar linkage. Friction. Fuel injection. Fuel pump. Fuel systems. Furnace (steam generating). Furnace construction. Gages. Gas furnace. Gas turbine. Gasket. Gear. Gear cutting. Gear drive. Gear loading. Gear train. Governor. Grab bucket. Grinding. Grinding mill. Gyrocompass. Gyroscope. Harmonic oscillator. Harmonic speed changer. Heat exchanger. Heat pump. Heat radiation. Heat transfer. Heating, comfort. Hoisting machines. Honing. Hot-water heating system. Humidification. Humidistat. Humidity control. Hydraulic actuator. Hydraulic press. Hydraulic turbine. Hydraulic valve lifter. Hydraulics. Hygrometer.

Ice manufacture. Ignition systems. Impulse turbine. Inclined plane. Industrial meteorology. Industrial trucks. Inertial guidance system. Instrumentation. Internal combustion engine. Jig, fixture, and die design. Joint, mechanical. Lapping. Lathe. Level measurement. Lever. Link. Linkage, mechanical. Loading, transverse. Loads, dynamic. Loads, repeated. Location fit. Locomotive. Lubrication, engine. Machine. Machine design. Machine elements. Machine key. Machinery. Machining

operations. Magnetic separation methods. Magneto. Manifold (engine). Manometer. Marine boiler. Marine engine. Marine engineering. Marine machinery. Marine refrigeration. Materials handling machines. McLeod gage. Mechanical advantage. Mechanical engineering. Mechanisms. Metal forming. Micrometer. Milling machine. Moisture-content measurement. Monorail. Motorcycle. Nailing. Nibbling. Nuclear power. Nut. Octane number. Oil furnace. Oldham's coupling. Otto cycle. Overdrive.

Packing. Packing house. Panel heating and cooling. Pantograph. Pawl. Pebble mill. Peening. Pelton wheel. Pendulum. Pirani gage. Planer. Plate, structural. Planetary gear train. Polishing. Power plant. Press fit. Pressure measurement. Pressure vessel. Prime mover. Product design. Prony brake. Psychrometer. Psychrometrics. Pulley. Pump. Pumping machinery. Radiant heating. Radiator. Rankine cycle. Ratchet. Raw water. Reactor, nuclear. Reactor, ship propulsion. Reaction turbine. Reamer. Refrigerated truck. Refrigeration. Refrigeration cycle. Refrigerator. Refrigerator car. Register, air. Reheating. Reliability of equipment. Ring. Rivet. Riveted joint. Roll mill. Rolling, metal. Rolling contact. Rope. Rope drive. Running fit. Safe. Safety factor. Safety valve. Sawing. Screening. Screw. Screw fastener. Screw jack. Screw threads. Seal, pressure. Separation (mechanical). Sewing machine. Shaft balancing. Shafting. Shaper. Sheet metal forming. Shock absorber. Shock isolation. Shovel, power. Shrink fit. Simple machine. Size reduction. Slider-crank mechanism. Sliding pair. Snap ring. Solar energy. Solar heating. Solids pump. Spark plug. Spectroscopy of combustion. Speedometer. Sprinkler, automatic. Spinning of metal. Splines. Spring (mechanical). Steam. Steam boiler. Steam condenser. Steam engine. Steam generating unit. Steam heating. Steam jet ejector. Steam separator. Steam temperature control. Steam turbine. Steering, power. Stoker. Straight-line mechanism. Stroboscope. Structural connections. Superheater. Surface condenser. Tachometer. Tank. Taper pin. Temperature-humidity index. Thermal expansion. Thermodynamic cycle. Thermostat. Threading. Tie rod. Tie. Toggle. Tolerance. Ton of refrigeration. Tooling. Torque. Torque converter. Torsion bar. Tracer, radioactive. Tractor. Transducer. Transmission, automotive. Truck. Tube-still heater. Turning mill. Tuning fork. Turbine. Turnbuckle. Turning (woodworking). Typewriter. Ultrasonic machining. Universal joint. Unloader. Vacuum cleaner. Vacuum pump. Valve. Valve train. Vapor cycle. Vapor lock. V-belt. Velocity analysis. Ventilation. Vibration damping. Vibration isolation. Vibration machine. Vibration pickup. Voltage regulator, automotive. Volumetric efficiency. Warm air heating system. Washer. Water power. Water-tube boiler. Wedge. Welded joint. Water hammer. Wheel and axle. Wheel base. Wind power. Wire. Woodworking.

For articles on rigid and fluid mechanics.

strength of materials, and related topics see **ENGINEERING MECHANICS**. For basic thermodynamic laws, principles, and processes see **THERMODYNAMICS**. For articles on materials see **INORGANIC CHEMISTRY**; **METALLURGICAL ENGINEERING**; **ORGANIC CHEMISTRY**. For articles on lubricants see **PETROLEUM CHEMISTRY**. For articles on machinability, plating, welding, and other metallurgical topics see **METALLURGICAL ENGINEERING**. For articles on structures see **CIVIL ENGINEERING**. For aeronautical structures see **AERONAUTICAL ENGINEERING**.

See also **CHEMICAL ENGINEERING**; **CONTROL SYSTEMS ENGINEERING**; **NUCLEAR ENGINEERING**.

## Mechanics

For engineering applications see **ENGINEERING MECHANICS**. For classical theoretical concepts see **CLASSICAL MECHANICS**. For statistical, quantum, and relativistic mechanics see **ATOMIC PHYSICS**; **MOLECULAR PHYSICS**; **SOLID-STATE PHYSICS**; **THEORETICAL PHYSICS**.

## Medical microbiology

Ablastin. Acanthamoebidae. Actinomycetaceae. Actinomycosis. Actinomyxidia. Actinophaga. Adeleida. Adenovirus. Aerobacter. Agglutination reaction. Agglutinin. Allergy, atopic. Ameba. Ameliasis. para-Aminosalicylic acid. Amoebida. Anaphylaxis. Animal virus. Anthrax. Antibacterial agents. Antibiotic. Antibody. Antigen. Antigen-antibody reaction. Antimicrobial agents. Antiseptic. Antitoxin. Aphelenchoidea. Arbor vital encephalitis. Arthus reaction. Ascariasis. Ascaridida. Ascaridina. Ascaridoidea. Ascaris. Ascomycetes. Aspergillosis. Avian leukosis. Bacillaceae. Bacillary dysentery. Bacteria. Bacteria, lysogenic. Bacteriology, medical. Bacteriophage. Bacteroidaceae. Balantidiasis. Bejel. Biological specificity. Biologicals. Blackleg. Blastomycosis. Botulism. Brucellaceae. Brucellosis. Candidiasis. Carrion's disease. Cat scratch disease. Cercaria. Cestoda. Chagas' disease. Chemotherapy. Chickenpox and shingles. Cholera vibrio. Chromomycosis. Clonorchiasis. Cnidosporidia. Coccidia. Coccidioidomycosis. Coenurosis. Cold, common. Coliphage. Complement (serum). Complement-fixation test. Conglutination. Corynebacteriaceae. Coxsackie virus. Cryptococcales. Cryptococcosis. Culture, elective. Culture, embryonated egg. Culture, media components of. Culture, pure. Culture, tissue. Culture technique. Cyclophyllidea. Cysticercosis. Cystitis. Dengue fever. Dermatophytosis. Digena. Diactophymoidea. Diphtheria. Disease. Disease carrier. Dracunculoidea. Drug resistance. Echino-coccosis. ECHO virus. Effective dose 50. Eimeriida. Encephalitis, equine. Endocarditis. Enteric bacilli. Enterobacteriaceae. Enterovirus. Epidemic. Epidemiology. Escherichia. Eubacteriales. Exanthem subitum. Fascioliasis. Fasciolopsiasis. Fever. Fièvre boutonneuse. Filariasis. Filarioidea. Flea. Food poisoning, bacterial. Foot and mouth disease.

Fungistat and fungicide. Gaffkya tetragena. Gangrene, gas. Germ. German measles. Germfree vertebrate. Glanders. Gonorrhea. Granuloma inguinale. Griseofulvin. Guinea worm infection. Haemosporidiida. Heartwater disease. Hemadsorption viruses. Hemophilic bacteria. Hemorrhagic septicemia. Herpes simplex. Heterophile antigen. Heterophyiasis. Histoplasmosis. Hookworm disease. Hyaluronidase. Hypersensitivity.

Immunity. Immunological tolerance, acquired. Immunology. IMViC test. Inclusion blennorrhoea. Inclusion bodies (virus). Infant diarrhea. Infection. Infection, lytic. Infection's disease control. Infectious disease transmission. Infectious mononucleosis. Infective dose 50. Influenza. Interferon. Isoantigen. Isonicotinic acid hydrazide. Johne's disease. Keratoconjunctivitis (epidemic). Klebsiella pneumoniae. Lactobacillaceae. Lancefield differentiation scheme. Leishmaniasis. Leprosy. Leptospira. Lethal dose 50. Leukocidin. Listeriosis. Louping-ill. Lymphocytic choriomeningitis. Lymphogranuloma venereum. Lymphogranuloma-psittacosis group. Lysin. Lytic reaction. Malaria. Mastitis (cows). Measles. Melioidosis. Meningitis. Meningococcus. Microbiological methods. Microscope, electron. Microscope, fluorescence. Microscope, optical. Microsporidia. Molluscum contagiosum. Monhysterioidea. Moniliaceae. Moniliales. Moraxella lacunata. Mouse viral leukemias. Mumps. Mycology, medical. Myiasis. Myxomatosis, infectious (rabbits). Myxosporidia. Myxovirus.

Nematoda. Neutralization reaction (antibody). Neutralizing antibody. Newcastle disease. Nitrofurantoin. Nocardiosis. Nystatin. Opsonin. Papillomatosis, infectious (rabbit). Paracolon bacilli. Paragonimiasis. Parainfluenza. Parapertussis. Parasitology, medical. Paratyphoid fever. Paratyphoid gastroenteritis. Phagocytosis. Phlebotomus fever. Phycocyanin. Pink eye. Pinta. Pinworm. Pinworm infection. Plague. Pleuropneumonia-like organism (PPLo). Pneumocystosis. Pneumonia. Pneumonitis. Poliomyelitis. Polyoma virus. Precipitin. Precipitin test. Properdin. Proteus. Pseudomonadaceae. Pseudomonas aeruginosa. Pseudophyllidea. Psittacosis. Public health.

Q fever. Quellung reaction. Rabies. Rat-bite fever. Relapsing fever. Rhabdiasoidea. Rhabditoidea. Rheumatic fever. Rickettsiales. Rickettsialpox. Rickettsioses. Rous sarcoma. Salivary gland virus disease. Salmonella. Sarcosporidia. Scarlet fever. Schistosomiasis. Septicemia. Serology. Shigella. Skin test. Sleeping sickness. African. Smallpox. Soft chancre. Sparganosis. Spirillaceae. Spirochete. Sporotrichosis. Sporozoa. Spotted fever. Rocky Mountain. Spotted fever group. Staphylococcus. Streptococcus. Strongyloidea. Strongyloidiasis. Sulfa drugs. Sulfone (antimicrobial use). Syphilis. Tapeworm. Tapeworm disease. Tetanus. Thiosemicarbazone. Tick. Tick bite fever. South African. Tick fever. Colorado. Tick paralysis. Tick typhus, North Queensland. Tick typhus, Siberian. Toxin,

bacterial. Toxin-antitoxin reaction. Toxoplasmosis. Trachoma. Trench fever. Trichinosis. Trichomoniasis. Trichuroidea. Trypanosomatidae. Tuberculosis. Tularemia. Tumor viruses. Tylenchoidea. Typhoid fever. Typhus, scrub. Typhus fever, endemic (flea-borne). Typhus fever, epidemic (louse-borne). Vaccination. Venereal disease. Vincent's angina. Viral gastroenteritis, epidemic. Virulence. Virus. Virus chemoprophylaxis. Virus infection, latent. Virus interference. Wart. Weil's disease. West Nile fever. Whipworm disease. Whooping cough. Yaws. Zoonoses.

For more information on oncology and other disease processes *see* ANIMAL PATHOLOGY; for the chemistry of the physiological processes *see* BIOCHEMISTRY.

*See also* MICROBIOLOGY.

## **Metallurgical engineering**

Alloy. Alloy structures. Arc welding. Beryllium alloys. Beryllium metallurgy. Brass. Brazing. Brittleness. Bronze. Cadmium metallurgy. Cast iron. Cermet. Cladding. Copper alloys. Corrosion. Creep of materials. Drawing of metal. Elastic limit. Elasticity. Electrometallurgy. Electroplating of metals. Electropolishing. Explosive forming. Extrusion. Ferroalloy. Flash welding. Flotation. Forging. Furnace (pressurized blast). Galvanizing. Gold alloys. Gold metallurgy. Grain boundaries (metallurgy). Hardness scales. Heat-treatment (metals and alloys). Hooke's law. Hydrometallurgy. Iron (extraction from ore). Iron alloys. Iron-silicon alloys.

Lead alloys. Lead metallurgy. Machinability (metals). Magnesium alloys. Metal. Metal, mechanical properties of. Metal and mineral processing. Metal coatings. Metal forming. Metal inspection, magnetic. Metal inspection, ultrasonic. Metallography. Metallurgy. Nickel alloys. Nickel metallurgy. Ore dressing. Permalloy. Pewter. Plastic deformation of metal. Powder metallurgy. Pyrometallurgy. Pyrometallurgy, nonferrous. Radioactivity (applications). Radiography of metals. Resilience. Rheology. Rolling, metal. Silver alloys. Silver metallurgy. Sintering. Soldering. Solid-state physics. Space-craft structures. Spinning of metal. Spot welding. Stainless steel. Steel. Steel manufacture. Stress and strain. Surface hardening of steel. Tempering. Tin alloys. Tin metallurgy. Titanium. Titanium metallurgy. Torch. Uranium metallurgy. Vacuum metallurgy. Welding and cutting of metals. Wrought iron. X-ray powder method. Young's modulus. Zinc alloys. Zinc metallurgy. Zone refining.

For construction applications *see* CIVIL ENGINEERING. For ore supply and location *see* GEOLOGY (MINERALOGY AND PETROLOGY). For the winning of ores and metals from the earth *see* MINING ENGINEERING. For analytical applications and control methods *see* ANALYTICAL CHEMISTRY; PHOTOGRAPHY.

## **Meteorology and climatology**

Aerology. Aeronautical meteorology. Agricultural meteorology. Air. Air glow. Air mass. Air pressure. Air temperature. Air waves, upper synoptic. Anemometer. Atmosphere. Atmospheric acoustics. Atmospheric adiabatic change. Atmospheric chemistry. Atmospheric electricity. Atmospheric high. Atmospheric low. Atmospheric pollution. Aurora. Backing wind. Baroclinic field. Barometer. Barotropic field. Bioclimatology. Brocken specter. Chinook. Climatic change. Climatic prediction. Climatology. Clinometer. Cloud. Cloud physics. Continentality, weather and climate. Coriolis acceleration and force. Cyclone. Degree-day. Dendrochronology. Dew. Dew point. Drought. Dust storm. Environmental protection. Fog. Front. Frost. Geostrophic wind. Gradient wind. Greenhouse effect, terrestrial. Growing season. Hail. Halo. Heat balance, terrestrial atmospheric. Humidity. Hurricane. Hydrometeorology. Hygrometer. Industrial meteorology. Insolation. Isanomal temperatures. Isentropic surfaces. Isobar (meteorology). Isopycnic. Isotach. Isothermal chart. Jet stream. Lightning. Marine influence on weather and climate. Mesosphere. Meteorological instrumentation. Meteorological optics. Meteorological rockets. Meteorological satellites. Meteorology. Micrometeorology. Millibar. Mirage. Moisture-content measurement. Monsoon. Naval meteorology. Ocean-meteorological relations. Polar meteorology. Precipitation (meteorology). Precipitation gages. Psychrometer. Psychrometrics. Radar meteorology. Radiation, terrestrial. Radioactive fallout. Rain shadow. Rainbow. Sensible temperature. Series. Sirocco. Smog. Snow. Solenoid (meteorology). Squall. Storm. Storm detection. Stratosphere. Sundog. Sunshine-duration transmitter. Temperature inversion. Temperature humidity index. Theodolite. Thunder. Thunderstorm. Tornado. Tree-ring hydrology. Tropical meteorology. Tropopause. Troposphere. Veering wind. Waterspout. Weather. Weather (forecasting and prediction). Weather map. Weather modification. Weather station. Wind. Wind measurement. Wind rose. Wind stress. Wind-shift line.

For related physical aspects of earth and atmosphere *see* GEOPHYSICS; for related chemical aspects, *see* GEOCHEMISTRY. For articles concerning the interaction of sea and atmosphere *see* OCEANOGRAPHY.

## **Microbiology**

Acetobacter suboxydans fermentation. Acetone-butanol fermentation. Acetone-ethanol fermentation. Achromobacteraceae. Acid-fast stain. Acrasiales. Actinomycetaceae. Actinomycetales. Actinoplanaceae. Agar. Amphotericin B. Antimicrobial agents. Antibacterial agents. Antibiotic. Antiseptic. Ascomycetes. Axenic culture. Azotobacteraceae.

Bacillaceae. Bacitracin. Bacteria. Bacteria, taxonomy of. Bacterial cell chemistry. Bacterial coenzyme. Bacterial endospores. Bacterial enzyme. Bacterial genetics. Bacterial growth. Bacterial luminescence. Bacterial metabolism. Bacterial motility. Bacterial nutrition. Bacterial physiology. Bacteriology. Bacteroidaceae. Basidiomycetes. Beggiatoales. Bioassay. Brevibacteriaceae. Brine, microbiology of. Brucellaceae. 2,3-Butanediol. Butter. Carbomycin. Caryophanales. Caulobacteraceae. Cheese. Chemostat. Chlamydo bacteriales. Chloramphenicol. Chlorotetracycline. Citric acid. Corynebacteriaceae. Cryptococcales. Culture, elective. Culture, media components of. Culture, pure. Culture technique. Cycloserine. Dematiaceae. Dimethylchlorotetracycline. Dextran. Discellaceae. Distilled spirits. Enterobacteriaceae. Enzyme (industrial production). Epoxysuccinic acid. Erysiphales. Erythromycin. Ethyl alcohol. Eubacteriales. Eumycetes. Eurotiaceae. Eurotiales. Fermentation. Food microbiology. Food poisoning, bacterial. Food preservation. Food spoilage. Fumagillin. Fumaric acid. Fungi. Fungi Imperfecti. Gallic acid. Gluconic acid. Gram's stain. Griseofulvin. Heterobasidiomycetidae. Homobasidiomycetidae. Humus. Hyphomicrobiales. Ice cream. Industrial microbiology. Iron transport compounds, microbial. Itaconic acid. Itartartaric acid. Kanamycin. Kojic acid. Labyrinthulales. Lactic acid. Lactobacillaceae. Lepidostromataceae. Lyophilization. Malt beverage. Manure. Marine microbiology. Melanconiales. Methanomonadaceae. Microbiology. Microbiological methods. Micrococccaeae. Microorganisms. Microtubules. Milk. Moniliaceae. Moniliales. Mushroom. Mycelia Sterilia. Mycobacteriaceae. Mycology. Mycoplasmales. Myriangiales. Myxobacteriales. Myxomycetes.

Neisseriaceae. Neomycin. Nitrobacteriaceae. Nitrogen cycle. Novobiocin. Nystatin. Oxytetracycline. Pasteurization. Pathogen (soil). Penicillin. Petroleum microbiology. Phycmycetes. Polymyxin. Propionibacteriaceae. Protophyta. Pseudomonadaceae. Pseudomonadales. Pseudomonadineae. Rhizobiaceae. Rhizosphere. Rhodobacteriaceae. Riboflavin. Rickettsiales. Rust (microbiology). Saccharomycetales. Schizomycetes. Schizophyceae. Siderocapsaceae. Smut (microbiology). Soil balance, microbial. Soil microbiology. Soil microorganisms. Soil mineral (microbial utilization). Soil phosphorus (microbial cycle). Sphaeroidaceae. Sphaeropsidales. Spirillaceae. Spirochaetales. Sporobolomycetales. Stain (microbiological). Sterilization. Steroid. Stilbellaceae. Streptomycetaceae. Streptomycin. Subtilin. Tetracycline. Textile microbiology. Thiobacteriaceae. Tuberculariaceae. Tyrothricin. Uredinales. Ustilaginales. Vinegar. Viomycin. Virales. Virus. Vitamin B<sub>12</sub>. Water analysis. Water microbiology. Water purification. Water-borne disease. Wine. Yeast. Yeast, industrial. Zythiaceae.

For articles on the chemical reactions in

physiology see BIOCHEMISTRY; for more information on plant diseases caused by microorganisms see PLANT PATHOLOGY.

See also ANIMAL PATHOLOGY; MEDICAL MICROBIOLOGY.

## Microscopy

See BIOPHYSICS; ELECTROMAGNETIC RADIATION; OPTICS.

## Mineralogy

For articles pertaining to rocks and minerals see GEOLOGY (MINERALOGY AND PETROLOGY); for additional treatment of related geochemical processes see GEOCHEMISTRY.

## Mining engineering

Assaying. Ball-bearing pulverizer. Boring and drilling. mineral. Buhrstone mill. Bulk-handling machines. Classification, mechanical. Coal mining. Conveying machines. Conveyor. Core drilling. Crushing and pulverizing. Drilling machine. Elevating machines. Grinding mill. Hoisting machines. Industrial trucks. Materials handling machines. Mining. Mining, open-cut or pit. Mining, placer. Mining, strip. Mining, underground. Mining excavation. Mining machinery. Mining operating facilities. Mining safety. Pebble mill. Prospecting. Quarrying. Roll mill. Safety lamp. Screening. Separation (mechanical). Size reduction. Tumbling mill. Ventilation. Well logging (mineral).

See also PETROLEUM ENGINEERING.

## Molecular biology

See BIOPHYSICS; CYTOLOGY; GENETAL PHYSIOLOGY.

## Molecular physics

Absorption (electromagnetic radiation). Adhesion, molecular. Angstrom. Atom. Atomic clock. Atomic structure and spectra. Boltzmann statistics. Boltzmann transport equation. Bose-Einstein statistics. Brownian movement. Chemical binding. Chemical compounds. Chemical structures. Chemistry. Cohesion (physics). Collision. Crystallization. Degeneracy (quantum states). Eigenfunction. Eigenvalue. Electron. Electron configuration. Electron diffraction. Electron paramagnetic resonance spectroscopy. Electron spin. Electronegativity. Energy level (quantum mechanics). Excited state. Exclusion principle. Fermi-Dirac statistics. Flame photometry. Franck-Condon principle. Ground state. Harmonic motion. Harmonic oscillator. Inorganic chemistry. Intermolecular forces. Magnetic resonance. Maser. Microwave spectroscopy. Molecular association. Molecular beams. Molecular physics. Molecular structure and spectra. Molecular weight. Molecule.

Neutron diffraction. Nuclear moments. Organic chemistry. Paramagnetism. Perturbation (quantum mechanics). Planck's constant. Polarimetric

analysis. Quantum (physics). Quantum mechanics. Quantum numbers. Quantum statistics. Quantum theory, nonrelativistic. Radiation chemistry. Radio-frequency spectroscopy. Rheology. Ritz's combination principle. Schrödinger's wave equation. Selection rules (physics). Spin (quantum mechanics). Stark effect. Stationary state. Statistical mechanics. Thermoanalysis. Uncertainty principle. Wave (physics). X-ray crystallography. X-ray diffraction. Zeeman effect.

See also ATOMIC PHYSICS.

## **Morphogenesis**

See GROWTH AND MORPHOGENESIS.

## **Morphology**

See ANIMAL ANATOMY; CYTOLOGY; GROWTH AND MORPHOGENESIS; HISTOLOGY; INVERTEBRATE ZOOLOGY; PALEOBOTANY; PALEONTOLOGY; PLANT ANATOMY; VERTEBRATE ZOOLOGY.

## **Mycology**

Actinomycetaceae. Ascomycetes. Blastomycosis. Candidiasis. Chromomycosis. Cryptococcales. Cryptococcosis. Dermatophytosis. Erysiphales. Eurotiaceae. Eurotiales. Fungi. Fungi Imperfecti. Fungistat and fungicide. Griseofulvin. Heterobasidiomycetidae. Histoplasmosis. Homobasidiomycetidae. Hypersensitivity. Melanconiales. Meningitis. Microbiological methods. Moniliaceae. Moniliales. Mycelia Sterilia. Mycology. Myriangiales. Nocardiosis. Phycomyces. Rhizosphere. Rust (microbiology). Saccharomycetales. Smut (microbiology). Sphaeroidaceae. Sphaeropsidales. Sporobolomycetales.

For industrial applications see MICROBIOLOGY; for the mycological aspects of plant disease see PLANT PATHOLOGY.

## **Naval architecture**

Antisubmarine warfare. Archimedes' principle. Armament, naval. Buoyancy. Center of gravity. Drydocking. Fluid dynamics. Fluid mechanics. Fluid-flow principles. Fluid-flow properties. Froude number. Hydrodynamics. Hydrofoil craft. Inland waterways transportation. Laminar flow. Landing ships and craft. Model theory. Naval architecture. Propeller, marine. Reynolds number. Seaplane. Ship, merchant. Ship, naval. Ship design. Ship propulsion. Ship salvage. Shipbuilding. Similitude. Streamline flow. Streamlining. Submarine. Towing tank. Turbulent flow. Underwater demolition. Wake (seagoing vessels). Wake flow. Water tunnel.

For theoretical aspects of fluid flow phenomena see FLUID MECHANICS.

## **Navigation**

Accelerometer. Air Almanac. Air navigation. Air traffic control. Airborne radar. Aircraft compass system. Aircraft low-approach systems. Airport surface detection equipment. Air-speed indicator.

Altimeter, pressure. Altimeter, radio. Astrolabe, prismatic. Automatic astronavigation. Automatic landing system. Azimuth. Buoy. Celestial navigation. Compass, magnetic. Compass, radio. Continuous-wave radar. Coordinate systems, terrestrial. Corner reflector antenna. Course-line computer. Dead reckoning. Decca. Dectra. Direction-finding equipment. Doppler radar. Geography, mathematical. Glide-path indicator. Great circle, terrestrial. Ground-controlled-approach system (GCA). Ground-position indicator (GPI). Gyrocompass. Gyroscope.

Hyperbolic navigation system. Inertial guidance system. Instrument landing system (ILS). Lighthouse. Loran. Marine navigation. Nautical Almanac. Navarho. Navigation. Navigation instruments. Navigation systems, electronic. Omega. Passive radar. Piloting. Polar navigation. Polar-coordinate navigation systems. Precision approach radar (PAR). Radar. Radio. Radio range. Satellite, navigation by. Schuler pendulum. Sextant. SOFAR. Sonar. Surveillance radar. Tacan. Terrain-clearance indicator. Vortac.

For astronomical bodies see ASTRONOMY. For articles on the earth's magnetic field see GEOPHYSICS. For articles on ocean currents and waves see OCEANOGRAPHY. For air currents and aeronautical meteorology see METEOROLOGY AND CLIMATOLOGY. For communication equipment see COMMUNICATIONS. For automatic control systems see CONTROL SYSTEMS ENGINEERING. For electronic devices and circuits see ELECTRONIC ENGINEERING.

## **Nuclear engineering**

Alpha rays. Aluminum. Atomic bomb. Atomic energy. Background count. Barn (unit). Beryllium. Beta rays. Betatron. Boron. Bubble chamber. Cadmium. Carbon. Ceramic technology. Cerenkov radiation. Cermet. Chain reaction, nuclear. Chemical engineering. Cloud chamber. Cockcroft-Walton accelerator. Cosmic rays. Critical mass. Crystal counter. Curie. Curium. Cyclotron. Decontamination (radioactive contaminants). Deuterium. Dosimeter. Ducted flow. Electromagnetic pump. Energy sources.

Film badge. Fission, nuclear. Flow measurement. Flow of fluids. Fluid-flow principles. Fluid-flow properties. Fusion, nuclear. Gamma rays. Geiger-Müller counter. Geophysical exploration. Graphite. Hafnium. Half-life. Health physics. Heat exchanger. Heavy water. Helium. Hydrazine. Hydrogen bomb. Impulse generator. Indium. Ion exchange. Ionization chamber. Irradiation, isotropic. Isomerism, nuclear. Isotope. Isotope dilution techniques. Isotope separation (stable isotopes). Junction detector.

Krypton. Lanthanum. Lead. Linear accelerator. Low-level counting. Luminous paint. Magnetogas dynamics. Magnetohydrodynamics. Mass number. Mean free path. Monitoring (ionizing radiation). Neutron. Neutron, delayed. Neutron



cross section. Nonstoichiometric compounds. Nuclear aircraft propulsion. Nuclear battery. Nuclear chemistry. Nuclear engineering. Nuclear explosion. Nuclear fuels. Nuclear fuels reprocessing. Nuclear power. Nuclear radiation. Nuclear reaction. Nuclear rocket. Nucleonics. Nucleus, atomic. Nuclide. Particle accelerator. Particle detector. Pinch effect. Pipe flow. Plasma physics. Plutonium. Polonium. Propulsion. Prospecting. Proton. Rad. Radiation. Radiation damage (inanimate materials). Radiation shielding. Radioactive fallout. Radioactive waste disposal. Radioactivity. Radioactivity (applications). Radioactivity, standards. Radiochemical laboratory. Radiochemistry. Radioisotope. Radioisotope assay. Radioisotope production. Radiometric assay. Radium. Reactor, nuclear. Reactor, nuclear (classification). Reactor, ship propulsion. Reactor physics. Refractory. Resonance transformer. Roentgen unit. Scintillation counter. Scintillation detector, liquid. Silver. Sintering. Size reduction. Spark counter. Stainless steel. Stripping. Synchrocyclotron. Synchrotron. Thermal expansion. Thermal neutrons. Thermal stress. Thermocouple. Thermonuclear reaction. Thorium. Thulium. Tracer, radioactive. Transmutation. Transuranium elements. Tritium. Unit operation. Uranium. Uranium metallurgy. Van de Graaff generator. Well logging (mineral). Xenon. Zirconium.

See also NUCLEAR PHYSICS.

## Nuclear physics

Absorption. Absorption (electromagnetic radiation). Actinium. Alpha rays. Americium. Antineutrino. Astatine. Astrophysics. Atom. Atomic bomb. Atomic energy. Atomic mass unit. Atomic number. Atomic weight. Barn (unit). Barium. Berkelium. Beta rays. Betatron. Binding energy, nuclear. Bismuth. Boltzmann transport equation. Bubble chamber. Carbon star. Carbon-nitrogen cycle. Chain reaction, nuclear. Cloud chamber. Critical mass. Crystal counter. Curie. Curium. Cyclotron. Deuterium. Deuteron. Elements (chemical). Fission, nuclear. Fusion, nuclear. Gamma rays. Half-life. Heavy water. Hydrogen bomb. Hyperfine structure. Ionization chamber. Isomerism, nuclear. Isotone. Isotope.

Junction detector. Linear accelerator. Magnetic resonance. Magnetogas dynamics. Magnethydrodynamics. Megneton. Mass defect. Mass number. Mean free path. Mössbauer effect. Multi pole radiation. Neutron. Neutron, delayed. Neutron cross section. Neutron optics. Nuclear chemistry. Nuclear explosion. Nuclear moments. Nuclear physics. Nuclear power. Nuclear radiation. Nuclear reaction. Nuclear spectra. Nuclear structure. Nucleon. Nucleonics. Nucleus, atomic. Nuclide.

Packing fraction. Pair production (electron-positron). Parity (quantum mechanics). Particle accelerator. Particle detector. Pinch effect. Plasma physics. Plutonium. Positron. Probability in physics.

Proton. Proton-proton chain. Quantum (physics). Quantum field theory. Radiation. Radiation chemistry. Radioactive species produced by cosmic rays. Radioactivity. Radioactivity, standards. Radioisotope. Radium. Radon. Reactor, nuclear. Reactor physics. Resonance transformer. Roentgen unit. Scattering (nuclear) dispersion relations. Scattering experiments, atomic and molecular. Scattering experiments, nuclear. Scintillation counter. Selection rules (physics). Spallation reaction. Spark chamber. Spin (quantum mechanics). Strange particle. Symmetry laws (physics). Synchrocyclotron. Synchrotron. Technetium. Thermal neutrons. Thermonuclear reaction. Thorium. Transmutation. Transuranium elements. Triton. Uranium. Van de Graaf generator. V-particle.

See also ATOMIC PHYSICS; MOLECULAR PHYSICS; NUCLEAR ENGINEERING.

## Oceanography

Antarctic Ocean. Antisubmarine warfare. Arctic Ocean. Atlantic Ocean. Atoll. Baltic Sea. Barrier reef. Bathyscaph. Bathythermograph. Bering Sea. Black Sea. Caribbean Sea. Continental shelf and slope. Coral reef. Coriolis acceleration and force. Deep-sea fauna. Delta. Echo sounder. Estuarine oceanography. Fringing reef. Gulf of Mexico. Gulf Stream. Halocline. Harbor. Hydrophone. Hydrosphere. Hydrosphere, geochemistry of. Ice islands. Iceberg. Indian Ocean. Mangrove swamp. Marine biological sampling. Marine ecosystem. Marine fisheries. Marine marsh. Marine microbiology. Marine navigation. Marine resources. Marine sediments. Mediterranean Sea. Naval meteorology. North Sea. Northwest Passage. Ocean currents. Ocean waves. Ocean-meteorological relations. Oceanic islands. Oceanography. Oceans and seas. Organic reef. Pacific Ocean.

Reef. River tides. Sargasso Sea. Scattering layer. SCUBA. Sea. Sea ice. Sea level (datum planes). Sea level fluctuations. Sea state. Sea water. Sea water fertility. Seamount and guyot. Seiche. Ship routing. Shore processes. Skin diving. SOFAR. Sonar. Sonobuoy. Southeast Asian waters. Storm surge. Submarine canyon. Submarine topography. Texas Towers. Thermocline. Tidal bore. Tide. Tsunami. Turbidity current. Underwater photography. Underwater sound. Underwater television. Upwelling. Wave (capillary). Wave (internal).

For related geophysical phenomena see GEOCHEMISTRY; GEOPHYSICS; METEOROLOGY and CLIMATOLOGY. For related aspects of marine biology see ANIMAL ECOLOGY; PLANT ECOLOGY.

## Optics

Aberration of light. Aberration, optical. Absorption. Absorption (electromagnetic radiation). Albedo. Angstrom. Aspheric surfaces, optical. Astronomical instruments. Astronomical spectroscopy. Atomic structure and spectra. Band spectrum.

Binoculars. Birefringence. Black. Brocken specter. Camera. Candle. Candlepower. Cathodoluminescence. Chemical microscopy. Chemiluminescence. Chromatic aberration. Cinematography. Color. Color centers. Color vision. Colorimetric analysis. Colorimetry. Comparator. Compton effect. Crystal optics.

DeBroglie wavelength. Dichroism. Dichroism (biological tissue). Diffraction. Diffraction grating. Diopter. Dispersion (radiation). Doppler effect. Electroluminescence. Electrooptics. Energy level (quantum mechanics). Eyepiece. Faraday effect. Field-emission microscopy. Filter, color. Fine structure (spectrum lines). Flame photometry. Focal length. Foot-candle. Foot-lambert. Franck-Condon principle. Frequency (wave motion). Fringe (optics). Ghost image, optical. Gray. Ground state. Gun sights.

Huygens' principle. Illuminance. Image, optical. Inertia of energy. Interference filter, optical. Interference of waves. Interferometry. Isotope shift. Kerr effect. Lambert. Lantern slides. Laser. Latent image. Lens, optical. Light. Light amplifier. Light panel. Line spectrum. Lumen. Lumen-hour. Luminance. Luminescence. Luminosity factor. Luminous efficiency. Luminous energy. Luminous flux. Luminous intensity. Luminous paint. Lux. Magneto-optics. Magnification. Meteorological optics. Micron. Microscope. Mirage. Mirror optics. Molecular structure and spectra. Observatory, astronomical. Opaque medium. Opera glasses. Optical fibers. Optical flat. Optical materials. Optical methods of chemical analysis. Optical recording. Optical tracking instruments. Optics. Optics, geometrical. Optics, physical. Paschen-Back effect. Penumbra. Periscope. Phosphorescence. Phot. Photon. Photoelasticity. Photoelectric devices. Photoelectricity. Photography. Photography, color. Photoluminescence. Photometer. Photometry. Planck's constant. Pleochroism. Point source. Polarimetric analysis. Polarized light. Prism, optical. Projection systems, optical. Projector (light). Pyrometer.

Quantitative chemical analysis. Quantum mechanics. Quantum physics. Radiation. Radiography. Radiography of metals. Rainbow. Raman effect. Rangefinder, optical. Reflection (electromagnetic radiation). Refraction of waves. Refractometric analysis. Resolving power (optics). Ritz's combination principle. Rotatory dispersion. Scattering (electromagnetic radiation). Schlieren photography. Schmidt camera. Shadow. Shadowgraph of fluid flow. Sine wave. Spectrochemical analysis. Spectrography. Spectrophotometric analysis. Spectroscopy. Spectrum. Spherical and aspheric surfaces (optical). Standing wave. Stationary wave. Stereoscopy. Stroboscopic photography. Sundog. Telephoto lens. Telescope. Telescope, astronomical. Thermoluminescence. Translucent medium. Transparent medium. Trichroism. Ultraviolet radiation. Umbra. Vectograph. Vision. Wave (physics). Wave equation. Wave motion. Wave optics. Wavelength.

White. X-ray optics. Zeeman effect. Zoom lens.

For articles on electromagnetic radiation in general see ELECTROMAGNETIC RADIATION. For articles on photoelectric effects and devices see SOLID-STATE PHYSICS.

## Organic chemistry

Acetal. Acetaldehyde. Acetate. Acetic acid. Acetone. Acetophenone. Acetyl phosphate. Acetylation. Acetylcholine. Acetylene. Acetylde. Acid anhydride. Acid halide. Acridine. Acidolysis. Acrolein. Acrylonitrile. Acylation. Addition polymerization. Addition reaction. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Adhesive. Adiponitrile. Adrenal cortex steroid. Alanine. Albumin. Alcohol. Alcoholysis. Aldehyde. Aldosterone. Alicyclic hydrocarbon. Aliphatic hydrocarbon. Alkaloid. Alkane. Alkanolamine. Alkene. Alkyl radical. Alkyne. Amide. Amide, acid. Amidine. Amine. Amino acids. Amino resins. para-Aminobenzoic acid. para-Aminophenol. Androgen. Aniline. Anise. Anthocyanin. Anthracene. Anthranilic acid. Anthraquinone pigments. Antibacterial agents. Arginine. Aromatic. Aromatic hydrocarbon. Ascorbic acid. Asparagine. Aspartic acid. Aspirin. Asymmetric synthesis. Atropine. Azole.

Benzaldehyde. Benzene. Benzidine. Benzate. Benzoic acid. Benzophenone. Benzynes. Biochemistry. Biotin. Biphenyl. 1,3-Butadiene. 2,3-Butanediol. Butane. Butanol. Caffeine. Camphor. Canbanion. Carbazole. Carbohydrate. Carbon compounds, bivalent. Carbon tetrachloride. Carbonium ion. Carboxylic acid. Carotenoid. Catechol. Cellulose. Cellophane. Cellulose. Cellulose derivatives. Cereal chemistry. Cetane. Cetane number. Cetyl alcohol. Chelation. Chemical warfare. Chitin. Chloramine-T. Chloroform. Chlorophyll. Cholesterol. Choline. Chromatophore. Citrate. Cocaine. Coenzyme. Condensation polymerization. Condensation reaction. Conformational analysis. Creatine-creatinine. Creosote. Cresol. Cyanocarbon. Cyclo-dodecatriene. 1,5-Cyclooctadiene. Cyclooctatetraene. Cyclopentadiene. Cysteine. Cystine.

Demethylchlorotetracycline. Dextran. Dextrin. Diastereoisomer. Diazine. Diazotization. Diels-Alder reaction. Diene. Digitoxigenin. Dioxane. Diphenylmethane. Diphenylpyridine nucleotide (DPN). Disulfide. Drying oil. Dye. Electrophilic and nucleophilic reagent. Enantiomorph. Enzyme. Epoxidation. Epoxy resin. Epoxysuccinic acid. Ergosterol. Essential oils. Ester. Estrogen. Ethane. Ether. Ethoxide. Ethyl acetate. Ethyl acetoacetate. Ethyl malonate. Ethylene. Ethylene chlorohydrin. Ethylene glycol. Ethylene oxide. Ethylenediamine-tetraacetic acid. Fat and oil, edible. Fat and oil, nonedible. Ferrocene. Flavone. Fluorocarbon. Folic acid. Formaldehyde. Formic acid. Freon. Friedel-Crafts reaction. Fructose. Fumaric acid. Furan. Furfural.

Galactose. Gallic acid. Gluconic acid. Glucose.

Glucose-1-phosphate. Glucose-6-phosphate. Glucoside. Glue. Glutamic acid. Glutamine. Glutelin. Glycerol. Glycine. Glycogen. Glycol. Glycolipid. Glycoside. Grignard reaction. Haloform reaction. Halogenated hydrocarbon. Hemicellulose. Hemoglobin. Heterocyclic compounds. Hexamethylene-tetramine. Hexaphenylethane. Histidine. Hormone. Hyaluronic acid. Hydrocarbon. Hydrocarbon resin. Hydroquinone. Hydroxylation reaction. Imidazole. Indene. Indole. Insulin. Inulin. Iodoform. Isocyanate. Isoleucine. Isomerism, molecular. Isoprene. Isoquinoline.

Ketene. Ketone. Kolbe hydrocarbon synthesis. Krebs cycle. Lactam and lactim. Lactase. Lactate. Lactide and lactone. Lactose. Lanoline. Leucine. Levan. Linoleum. Linseed oil. Lipid. Lysine. Maltase. Maltose. Mannan. Menthil. Mercaptan. Methane. Methanol. Methionine. Methyl ethyl ketone. Monosaccharide. Morphine. Morpholine. Mucilage. Naphthalene. Naphthol. Naphthylamine. Nicotin. Nicotine. Nitrile. Nitro and nitroso compounds. Nitrobenzene. Nitroparaffin. Nucleic acid. Nucleoprotein. Nutrition. Nylon. Octane. Octane number. Oleate. Olefin sulfide. Oligosaccharide. Optical activity. Organic chemical synthesis. Organic chemistry. Organic reaction mechanism. Organoarsenic compound. Organometallic compound. Organophosphorus compound. Organosulfur compound. Orthoester. Oxalate. Oxalic acid. Oxazole. Oxime. Oxytetracycline. Ozonization.

Palmitate. Pantothenic acid. Paraffin. Pectin. Pentaerythritol. Peptide. Pharmaceutical chemistry. Pharmacognosy. Pharmacology. Pharmacy. Phenacetin. Phenanthrene. Phenol. Phenolformaldehyde resin. Phenylalanine. Phosphate. Photosynthesis. Phthalic acid. Phthalimide. Picric acid. Pinene. Plant fermentation. Plant hormones. Polyacrylate resin. Polyacrylonitrile resin. Polyalkene. Polyamide resin. Polyester resins. Polyether resins. Polyethylene glycol. Polyfluoroolefin resin. Polyhydroxy alcohol. Polymer. Polymer properties. Polymerization. Polynuclear hydrocarbon. Polyolefin resins. Polyoxyethylation of alcohol. Polysaccharide. Polystyrene resin. Polysulfide resins. Polyurethane resins. Polyvinyl resins. Porphyrin. Progesterone. Prolamine. Proline. Propane. Propanol. Propylene. Protein. Pyran. Pyrazole. Pyridine. Pyrimidine. Pyrrole. Quaternary ammonium salts. Quinine. Quinoline. Quinone. Racemization. Raffinose. Reformatsky reaction. Resin. Resonance (molecular structure). Resorcinol. Riboflavin. Rosin. Saccharin. Salicylate. Schiff base. Serine. Serotonin. Silicone resins. Soap and detergent. Sphingolipid. Squalene. Stearate. Stereochemistry. Steric effect (chemical reaction). Steroid. Sterol. Strychnine. Styrene. Substitution reaction. Sucrose. Sulfamate. Sulfamic acids. Sulfanilic acid. Sulfenyl chloride. Sulfonic acid. Sulfonamide. Sulfone (chemical). Sulfonic acid. Sulfonyl chloride. Sulfoxide.

Tall oil. Tannin. Tartaric acid. Tartrate. Tau-

tomericism. Terpene. Tetracycline. Tetraethyllead. Theobromine. Thiamine. Thiazole. Thio compounds. Thioaldehyde and thioketone. Thioether. Thiophene. Thiourea. Threonine. Toluene. Toluidine. Transamination. Trichloroacetic acid. Trifluoroacetate. Triglyceride. Triphenylmethane. Triphosphopyridine nucleotide (TPN). Triterpene. Tropolone. Turpentine. Tryptophan. Tyrosine. Unsaturated hydrocarbon. Urea. Urea-formaldehyde type resins. Ureid. Urethane. Uric acid. Uridine diphosphoglucose (UDPG). Valine. Vinyl resin. Vinylgly. Vitamin A. Vitamin B<sub>1</sub>. Vitamin B<sub>2</sub>. Vitamin D. Vitamin E. Vitamin K. Wax, animal and vegetable. Wood fiber products. Wood preservation. Wurtz-Fittig reaction. Wurtz reaction. Xylene.

For theoretical aspects see ATOMIC PHYSICS. For the biochemical interrelationships and life processes see BIOCHEMISTRY. For technical applications and production methods see CHEMICAL ENGINEERING. For construction applications see MECHANICAL ENGINEERING. For the molecular theory of see MOLECULAR PHYSICS. For the daily application of organic synthesis see PETROLEUM ENGINEERING. For the physical methods of determining critical constants see PHYSICAL CHEMISTRY.

## Paleobotany

Algae fossils. Archaeopteridales. Archeology. Bennettitales. Calamitales. Cambrian. Carboniferous. Caytoniales. Cenozoic. Charophyta. Coal balls. Coal paleobotany. Conopteridales. Coralline algae. Cordaitales. Cretaceous. Cryptozoen. Cycadeoidales. Cycadofilicales. Devonian. Eocene. Evolution, organic. Fossil seeds and fruits. Girvanella. Halimeda. Hyeniales. Jurassic. Lepidodendroides. Mesozoic. Miocene. Mississippian. Nematophytales. Noeggerathiales. Oligocene. Ordovician. Paleobotany. Paleocene. Paleozoic. Palynology. Pennsylvanian. Permian. Petrification. Petrified forests. Plant evolution. Pleistocene. Pleuromeiales. Pliocene. Postglacial vegetation and climate. Pseudoborniales. Psilophytales. Pteridospermae. Quaternary. Recent. Silurian. Solenopora. Speciation. Sphenophyllales. Tertiary. Triassic.

For phylogenetic considerations see EVOLUTION; for classification of the plant kingdom see PLANT TAXONOMY.

## Paleontology

Acanthodii. Arthropoda. Amphibia fossils. Anapsida. Anapsida. Animal evolution. Annelida fossils. Anthracosauria. Anthropology, physical. Anthroposcopy. Antiarchi. Archisodondyli. Archaeocyatha. Archaeornithes. Archosauria. Arctolepiformes. Arthrodira. Artiodactyla fossils. Astrapotheria. Atremata. Aves (fossil). Batoida fossils. Brachiopoda. Brachythoraci. Bradyodonti. Bryozoa fossils. Cambrian. Carboniferous. Carnivora fossils. Cenozoic. Cephalopoda fossils. Cetacea fossils. Chemical fos-

sils. Chimaerae. Chiroptera fossils. Cladoselachii. Coccolithophorida. Coelenterata fossils. Coelolepida. Condylarthra. Coniarchia. Conodont. Conularida. Cotylosauria. Cretaceous. Cro-Magnon man. Crocodilia fossils. Dermoptera fossils. Desmostylia. Devonian. Dinocerata. Dinornithiformes. Dinosaur. Docodonta. Echinodermata fossils. Edentata fossils. Elasmobranchii fossils. Embolomeri. Embriothopoda. Eocene. Euryapsida. Eurypterida. Evolution, organic. Fontéchevade man. Foraminifera fossils. Fossil. Fossil man. Fusulinidae.

Gastrolith. Gastropoda fossils. Graptolithina. Heidelberg man. Hesperornis. Heterostraci. Hybodontoida. Hyracoidea fossils. Ichthyopterygia. Ichthyornis. Ichthyosauria. Ichthyostegalia. Ichthyosauria. Index fossil. Insecta fossils. Insectivora fossils. Java man. Jurassic. Labyrinthodontia. Lagomorpha fossils. Lepidosauria. Lepospondyli. Life, origin of. Litopterna. Living fossils. Mammalia fossils. Marsupialia fossils. Merostomata. Mesosauria. Mesozoic. Micropaleontology. Microsauria. Miocene. Mississippian. Monoplacophora. Monotremata fossils. Multituberculata. Myodocopa. Neanderthal man. Nectridia. Neotremata. Notoungulata. Nummulites. Oligocene. Ordovician. Ornithischia. Osteichthyes (fossil). Osteostraci. Ostracoda. Ostracoderm. Palaeospondyloidea. Palaeotremata. Paleocene. Paleocology. Paleocology (geochemical aspects). Paleontology. Paleozoic. Pantodonta. Pantotheria. Peking man. Pelecypoda fossils. Pelycosauria. Pennsylvanian. Perissodactyla fossils. Permian. Pholidota fossils. Piltdown man. Placodermi. Pleistocene. Pleurocanthodii. Pliocene. Porifera fossils. Primates (fossil). Proboscidea fossils. Protista. Protosauria. Protremata. Pterosauria. Pyrotheria. Quaternary. Recent. Reptilia fossils. Rhachitomi. Rhodesian man. Rodentia fossils. Rugosa. Saurischia. Sauropterygia. Scleractinia fossils. Selachii fossil. Seymouriamorpha. Silicoflagellata. Silurian. Sirenia fossils. Solo man. Speciation. Sphaeractinoidea. Stegoselachii. Steinheim man. Stereospondyli. Stromatoporoidea. Swanscombe man. Symmetrodonta. Synapsida. Tabulata. Tactiodonta. Telotremata. Temnospondyli. Ternifine man. Tertiary. Thecodontia. Therapsida. Tillodontia. Tintinnina. Trematosauria. Triassic. Triconodonta. Tubulidentata fossils. Xenungulata.

For phylogenetic aspects see EVOLUTION; for living groups of animals see INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

## Parasitology

Acanthocephala. Acnidosporidea. Actinomyxid. Adeleida. Ameba. Amebiasis. Amphilinidea. Anoplura. Aphelenchoidea. Aporida. Archiacanthocephala. Arhynchobdellae. Ascariasis. Ascaridida. Ascaridina. Ascaris. Aspidogastrea. Axonolaimoidea. Balantidiiasis. Bedbug. Branchiura. Calanoida. Caligoida. Cephalobaenida. Cercaria. Cestoda. Cestodaria. Cestoidea. Chagas' disease. Chemotherapy.

Chigger. Chromadoroidea. Cirripedia. Cladocopa. Clonorchiasis. Cnidosporidia. Coccidia. Coenurosis. Copepoda. Cyclophyllidea. Cyclopoida. Cysticercosis. Desmodoroidea. Dicyemida. Digenea. Diectophymoidea. Diphyllidea. Dorylaimoidea. Dracunculoidea. Echinococcosis. Eimeriida. Eocanthocephala. Epicaridea. Eucestoda. Eugregarinida.

Fascioliasis. Fasciolopsiasis. Filariasis. Filarioidea. Flea. Gregarinidia. Guinea worm infection. Gyrocotylidea. Haemosporidiida. Haplosporidia. Helicosporidia. Heterophyiasis. Hirudinea. Hookworm disease. Hyperidea. Ixodides. Lecanicephaloidea. Leech. Leishmaniasis. Lernaeopodoida. Louse. Mallophaga. Mermithoidea. Mesostigmata. Mesozoa. Microsporidia. Mite. Monhysterioida. Monogenea. Moruloidea. Myiasis. Myodocopa. Myxosporidia. Nematoda. Nippotaeniidea. Onychopalpida. Orthonectida. Oxyurina. Oxyuroidea. Palaeacanthocephala. Paragonimiasis. Parasitic castration. Parasitology. Parasitology, medical. Pentastomida. Pinworm. Pinworm infection. Platyhelminthes. Plectoidea. Pneumocystosis. Porocephalida. Proteocephaloidea. Proteomyxida. Pseudophyllidea. Rhabdiarioidea. Rhahditoidea. Rhizocephala. Rhynchobdellae. Sarcophormes. Sarcosporidia. Schizogregarinida. Siphonaptera. Sparganosis. Spuriroidea. Sporozoa. Strongyloidea. Strongyloidiasis. Tapeworm. Tapeworm disease. Telosporoidea. Tetraphyllidea. Tick. Toxoplasmosis. Trematoda. Trichinosis. Trichomoniasis. Trichuroidea. Trombidiformes. Trypanorhyncha. Trypanosomatidae. Tylenchoidea. Whipworm disease.

## Pathology

See ANIMAL PATHOLOGY; MEDICAL MICROBIOLOGY; MYCOLOGY; PARASITOLOGY; PLANT PATHOLOGY; PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL; VIROLOGY.

## Petroleum chemistry

Acetylene. Aircraft fuel. Alkylation, petroleum. Analytical chemistry. Anti-freeze mixture. Anti-knock agents. Aromatization. Carbon black. Carbon compounds, bivalent. Coking (petroleum refining). Cracking. Depolymerization. Dewaxing (petroleum). Diesel fuel. Distillate fuel. Ethylene. Flash point. Fractionating column. Fuel oil. Gas field and gas well. Gasoline. Isomerization. Jet fuel. Kerosene. Liquefied petroleum gas (LPG). Lubricant. Lubrication, engine. Naphtha. Oil analysis. Oil and gas field development. Petrochemical. Petrolatum. Petroleum engineering. Petroleum processing. Petroleum products. Pour point. Reforming (petroleum refining). Sampling techniques. Tube-still heater. Wax, petroleum.

For design methods and unit operations see CHEMICAL ENGINEERING; for relationships with earth sciences see GEOCHEMISTRY; for the components of production see MECHANICAL ENGINEERING; for methods used in petroleum synthesis see ORGANIC CHEMISTRY.

## Petroleum engineering

Cable-tool drill. Centrifugal pump. Darcy. Displacement pump. Gas field and gas well. Geophysical exploration. Oil and gas field development. Oil and gas field exploitation. Oil and gas storage. Oil and gas well drilling. Oil and gas wells. Oil mining. Oil-field model. Petroleum engineering. Petroleum geology. Petroleum reservoir engineering. Petroleum secondary recovery. Photoclinometer. Prospecting, petroleum. Pump. Pumping machinery. Rotary tool drill. Turbodrill.

See also MINING ENGINEERING; PETROLEUM CHEMISTRY.

## Petrology

For articles pertaining to rocks and minerals see GEOLOGY (MINERALOGY AND PETROLOGY); for additional treatment of related geochemical processes see GEOCHEMISTRY.

## Photography

Aberration, optical. Acetic acid, para-Aminophenol. Astronomical photography. Buffer solution. Camera. Candle. Candlepower. Catechol. Cellulose derivatives. Chelation. Cinematography. Colorimetry. Drying. Dye. Exposure meter. Filter, color. Focal length. Foot-candle. Foot-lambert. Free radical. Hydroquinone. Image, optical. Indicator, acid-base. Inhibitor, chemical. Lantern slides. Latent image. Lens, optical. Lumen. Metallography. Microfilming. Microradiography. Optical tracking instruments. Organic chemistry. Phot. Photoflash lamp. Photographic materials. Photography. Photography, color. Photometer. Photometry. Physical chemistry. Pigment. Polymer. Projection systems, optical. Radiography. Rangefinder, optical. Schlieren photography. Schmidt camera. Shadowgraph of fluid flow. Sound track. Stroboscopic photography. Spectrography. Telephoto lens. Telephotography. Tyndall effect. Underwater photography. Zoom lens.

## Physical chemistry

Absorption. Activity (thermodynamics). Adhesion, molecular. Adiabatic demagnetization. Adsorption. Aerosol. Amphoterism. Antioxidant. Archimedes principle. Atomic clock. Avogadro's law. Avogadro number. Azeotropic mixture. Base, chemical. Battery (electric). Beattie-Bridgeman equation. Bernoulli's theorem. Black body. Boiling point. Boyle's law. British thermal unit (Btu). Buffer solution. Burning velocity measurement. Calomel electrode. Calorie. Colorimetry. Carnot cycle. Catalysis. Cell (electric). Cell (pressure-temperature effects). Chain reaction, chemical. Charles' law. Chemical energy. Coacervation. Coagulation. Colloid. Concentration scales. Conservation of energy. Coordination chemistry. Convection (heat). Coulometer. Countercurrent mass-transfer operation. Critical constant. Cryogenics. Curie. Dalton's law. Decomposition potential. Deliquescence. Dewar flask. Dial-

ysis. Diffusion in gases and liquids. Distillation. Distillation, molecular. Donnan equilibrium. Dry cell. Edison battery. Efflorescence. Electrochemical equivalent. Electrochemical process. Electrochemistry. Electrode. Electrode potential. Electrokinetic phenomena. Electrokinetic transducer. Electrolysis. Electrolytic conductance. Electromotive force (cells). Electroosmosis. Electrophoresis. Electroplating of metals. Electrostatic precipitator. Emulsion. Energy. Energy sources. Enthalpy. Entropy. Equilibrium, chemical. Equilibrium, ionic. Equilibrium, phase. Evaporation. Fast chemical reactions. First-order transition. Foam. Free energy. Free radical. Fuel cell. Fugacity.

Gas. Gas constant. Gas dynamics. Gas kinematics. Gas kinetics. Gas mechanics. Gel. Gibbs function. Glass electrode. Gram. Gray body.

Half-life. Heat. Heat balance. Heat capacity. Heat radiation. Heat transfer. Hydration. Hydrogen bond. Hydrogen electrode. Hydrolysis. Ice point. Incandescence. Inhibitor (chemical). Insulation, heat. Interface of phases. Internal energy. Ionization. Ionization chamber. Ionization gage. Ionization potential. Impermeable membrane. Irradiation, isotropic. Isoelectric point. Isomerism, nuclear. Isotope. Isotope. Isotope dilution techniques. Isotope separation (stable isotopes). Isotope shift. Joule. Kilogram. Kinetics (chemical). Kinetics (classical). Kinetic theory of matter. Linear accelerator. Liquefaction of gases. Liquid. Loschmidt's number. Low-temperature physics. Low-temperature thermometry. Mass. Mass spectroscopy. Matter (physics). Melting point. Mercury battery. Meter (unit). Metric system. Micelle. Molar volume. Molecular association. Molecular sieve. Neutralization. Neutron. Neutron delayed. Neutron cross section. Nuclear chemistry. Nuclear magnetic resonance, high resolution. Osmosis. Overvoltage. Parachor. Photochemistry. Photography. Physical chemistry, pk. Planck's radiation law. Primary battery. Pyrometer. Quantum chemistry. Quantum physics.

Radioactivity. Radiochemistry. Refraction (molar). Refrigeration cycle. Reserve battery. Rheology. Salt bridge. Salting-out effect. Saturation of solutions. Second-order transition. Silver chloride electrode. Solid solution. Solion. Solubility product constant. Solution. Solvation. Specific gravity. Storage battery. Streaming potential. Sublimation. Superconductivity. Superfluidity. Surface phenomenon. Surface tension. Surface-active agent. Temperature. Temperature measurement. Thermal expansion. Thermoanalysis. Thermochemistry. Thermocouple. Thermodynamics (chemical). Thermometer. Transference number. Transition point. Triple point. Tyndall effect. Ultracentrifuge. Ultrafiltration. Ultramicroscopy. Units, systems of. Valence. Van der Waals equation. Vapor pressure. Viscosity of gases. Viscosity of liquids. Wave equation. Wet cell. Work function (thermodynamics). X-ray diffraction.

For the theoretical aspects of the atom and the nucleus *see* **ATOMIC PHYSICS**. For the life sciences applications *see* **BIOCHEMISTRY**. For the visible and invisible wave applications *see* **ELECTROMAGNETIC RADIATION**. For the solid state relationships *see* **SOLID-STATE PHYSICS**; **THEORETICAL PHYSICS**.

## Physical geography

Aerial photograph. Africa. Alidade. Antarctic Circle. Antarctica. Arctic and subarctic islands. Arctic Circle. Asia. Australia and New Zealand. Azimuth. Basin. Cartography. Chinook. Climatology. Clinometer. Conservation of resources. Continent. Continentality. weather and climate. Contour. Coordinate systems. terrestrial. Cordilleran belt. Desert. Dune vegetation. Earth. Earth (orbital motion). Earth resource patterns. East Indies. Environmental protection. Equator. Equinox. Europe. Forest conservation. Forest mapping. Forest vegetation. Geography, mathematical. Geography, physical. Globe, terrestrial. Great circle, terrestrial. Hill and mountain terrain. Hydrography. Hydrolaccolith. International Date Line.

Lake. Land use planning. Level (surveying). Map design. Map projections. Map reproduction. Map scale. Marine influence on weather and climate. Mineral fuel areas. Mineral resource areas. Mineral resources conservation. Monsoon. Mountain. Mountain systems. North America. North Pole. Oasis. Pacific islands. Permafrost. Photogrammetry. Plains. Plane table. Plateau. Polar meteorology. Polygonal ground. Prairie. Precession of Equinoxes.

Range land conservation. River. Sirocco. Snow line. Soil (great soil groups). Soil zonal distribution. Soil conservation. Solstice. South America. South Pole. Stadia. Steppe. Surveying. Terrain areas. world-wide. Theodolite. Time. Topographic surveying and mapping. Tropic of Cancer. Tropic of Capricorn. Tundra. Vegetation zones (world). Water conservation. Weather map. West Indies.

For biogeography articles *see* **ANIMAL ECOLOGY**; **PLANT ECOLOGY**. For articles on the origin of land forms and major earth forms, *see* **GEOLOGY (SURFICIAL AND HISTORICAL)**. For related articles on the earth and its atmosphere *see* **GEOPHYSICS**; **METEOROLOGY AND CLIMATOLOGY**. For articles on the oceans and seas *see* **OCEANOGRAPHY**.

## Physics

*See* **ACOUSTICS**; **ATOMIC PHYSICS**; **CLASSICAL MECHANICS**; **ELECTRICITY AND ELECTROMAGNETISM**; **ELECTROMAGNETIC RADIATION**; **FLUID MECHANICS**; **HEAT**; **MOLECULAR PHYSICS**; **OPTICS**; **NUCLEAR PHYSICS**; **SOLID-STATE PHYSICS**; **THEORETICAL PHYSICS**; **THERMODYNAMICS**.

## Physiology

*See* **BIOCHEMISTRY**; **BIOPHYSICS**; **COMPARATIVE PHYSIOLOGY**; **GENERAL PHYSIOLOGY**; **MICROBIOL-**

**OGY**; **PLANT PHYSIOLOGY**; **PSYCHOLOGY**, **PHYSIOLOGICAL AND EXPERIMENTAL**.

## Plant anatomy

Bark. Bud (botany). Budding. Collenchyma. Cortex, plant. Endodermis. Epidermis, plant. Flower (botany). Fruit (botany). Grafting of plants. Hypodermis. Inflorescence. Leaf (botany). Meristem, apical. Meristem, lateral. Parenchyma. Pericycle. Periderm. Phloem. Pith. Plant anatomy. Plant morphogenesis. Plant organs. Plant tissue systems. Root (botany). Sclerenchyma. Secretory structures, plant. Seed (botany). Sicle. Stem (botany). Stem cuttings. Vascular bundles. Wood (anatomy and identification). Xylem.

For certain economic aspects *see* **AGRICULTURE**; **FORESTRY**; for environmental and functional aspects of plants *see* **PLANT ECOLOGY**; **PLANT PHYSIOLOGY**; for classification of plants *see* **PLANT TAXONOMY**.

## Plant ecology

Biome. Biotic isolation. Climax community. Climax plant formations. Community. Dune vegetation. Ecologic interactions. Ecology. Ecology, applied. Ecology, physiological. Ecosystem. Environment. Forest vegetation. Fresh water ecosystem. Island faunas and floras. Mangrove swamp. Marine marsh. Merriam's life zones. Oasis. Plant community. Plant geography. Plant societies. Population dispersal. Population dispersion. Species population. Steppe. Terrestrial ecosystem. Territoriality. Tundra. Vegetation management (right of way). Vegetation zones. Vegetation zones (world). Zoogeographic region.

For economic aspects *see* **AGRICULTURE**; for certain biotic factors *see* **ANIMAL ECOLOGY**; for marine environments *see* **OCEANOGRAPHY**; for physical factors of the environment *see* **PHYSICAL GEOGRAPHY**. For structure and function of plants and plant tissues *see* **PLANT ANATOMY**; **PLANT PHYSIOLOGY**.

## Plant kingdom

Abaca. Acrasiales. Actinomycetaceae. Actinomycetales. Actinoplanaceae. Aerobacter. Alfalfa. Algae. Algae fossils. Allspice. Almond. Andreaeales. Andreaeobrya. Angiospermae. Anise. Annual plants. Anthocerotae. Apple. Apricot. Arales. Arbovitae. Archaeopteris. Archichlamydeae. Aristolochiales. Artichoke. Ascolichenes. Ascomycetes. Ash. Asparagus. Avocado. Azotobacteraceae. Bacillaceae. Bacteroidaceae. Balanopsidales. Balsa. Bamboo. Banana. Barley. Basidiolichenes. Basidiomycetes. Basswood. Bean. Beech. Beet. Begoniatales. Belladonna. Bennettiales. Bermuda grass. Betel nut. Biennial plants. Birch. Blackberry. Blueberry. Bluegrass. Bluestem grass. Breadfruit. Brevibacteriaceae. Broccoli. Brome

grass. Brucellaceae. Brussels sprouts. Bryophyta. Buckeye. Buckwheat. Buxbaumiales. Cabbage. Cacao. Cactus. Calamitales. Calicales. Campanulales. Camphor-tree. Cantaloupe. Caraway. Cardamon. Carrot. Caryophanales. Cashew. Cassava. Castor bean. Casuarinales. Cauliflower. Caulobacteraceae. Caytoniales. Cedar. Celery. Centrospermales. Charales. Charophyceae. Charophyta. Cherry. Cherry, wild black. Chestnut. Chicory. Chlamydo-bacteriales. Chlorococcales. Chlorophyceae. Chlorophyta. Cholera vibrio. Chrysophyta. Cinchona. Cinnamon. Citron. Citronella. Cladophorales. Clove. Clover. Coca. Coconut. Coenopteridales. Coffee. Cola. Colehiaine. Collard. Coniferales. Coniferophytae. Conjugales. Cordaitales. Coriander. Corn. Cotton. Cowpea. Crabapple. Cranberry. Cress. Cryptococcales. Cubeb. Cucumber. Cumin. Currant. Curry. Cyanophyta. Cycadales. Cycadeoidales. Cycadofilicales. Cycadophytae. Cypress.

Dallis grass. Dasheen. Dasycladales. Date. Dawsoniales. Deciduous plants. Degenetiaceae. Dematiaceae. Dennis. Diatom. Dicotyledoneae. Dierraeles. Digitalis. Dill. Discellaceae. Douglas-fir. Elenales. Ebony. Eggplant. Elm. Embryophyta. English walnut. Enterobacteriaceae. Ephedra. Equisetales. Equisetaceae. Erucales. Erysphales. Escherichia. Eubacteriales. Eubrya. Eubryales. Eucalyptus. Englenophyta. Emmycetes. Enotriaceae. Enotriales. Evergreen plants. Fagales. Farnales. Fennel. Fescue. Fig. Filbert. Filicales. Filicineae. Fir. Fissidentales. Flax. Funariales. Fungi. Fungi Imperfecti.

Gaffya tetragena. Garlic. Gentianales. Geraniales. Ginger. Ginkgoales. Ginseng. Gnetales. Gooseberry. Graminales. Grapefruit. Grumiales. Guava. Guavule. Gymnospermae. Hackberry. Helobiales. Hemlock. Hemp. Hepaticae. Heterobasidiomycetidae. Hickory. Holly. Homobasidiomycetidae. Honeydew melon. Hop. Hophornbeam. Hornbeam. Horseradish. Hyeniales. Hyphomycetobiales. Hypnobryales. Hysteriales (lichenized). Insectivorous plants. Ipecac. Isobryales. Isoetales. Juglandales. Jute. Kale. Kapok tree. Kentucky colicetree. Klebsiella pneumoniae. Kohlrahi. Kudzu. Labyrinthulales. Lactobacillaceae. Larch. Lecanorales. Legume. Leitneriales. Lemon. Lepidodendrales. Leptosia. Leptostromataceae. Lepedeza. Lettuce. Lichenes. Lichenes Imperfecti. Licorice. Lignumvitae. Liliales. Lime (botanical). Linen. Locust (forestry). Lupine. Lychee. Lycopodiales. Lycopodiaceae. Lycopsidea. Magnolia. Mahogany. Malvales. Mandarin. Mango. Maple. Marattiales. Marijuana. Melanconiales. Meningococcus. Metachlamydeae. Micrococcaceae. Microtatabiotes. Millet. Mistletoe. Moniliaceae. Moniliales. Monocotyledoneae. Mulberry. Musci. Mushroom. Muskmelon. Mustard. Mycelia Sterilia. Mycobacteriaceae. Mycoplasmatales. Myriangiales. Myricales. Myrtales. Myxobacterales. Myxomycetes. Nectarine. Neisseriaceae. Nematophytales. Nitrobacteriaceae. Noeggerthiales. Nutmeg. Oak. Oats.

Oedogoniales. Okra. Olive. Onion. Ophioglossales. Opuntiales. Orange. Orchid. Orchidales. Osage-orange.

Palm. Palmales. Pandanales. Papaverales. Paprika. Parietales. Parsley. Parsnip. Pea. Peach. Peanut. Pear. Pecan. Pepper. Pepper (black). Peppermint. Perennial plants. Phaeophyta. Phycmycetes. Piña. Pine. Pineapple. Piperales. Pistachio. Pitcher plant. Plant. Plantaginales. Pleuromeiales. Plum. Pneumococcus. Poison ivy. Poison sumac. Poisonous plants. Polygonales. Polytrichales. Pomegranate. Poplar. Poppy. Pottiales. Primulales. Propionibacteriaceae. Proteales. Proteus. Protophyta. Pseudoborniales. Pseudomonadaceae. Pseudomonadales. Pseudomonadinae. Pseudomonas aeruginosa. Pseudosphaeriales (lichenized). Psilophytales. Psilophytineae. Psilopsida. Psilotales. Pteridospermae. Pteropsida. Pyrenulales. Pyrrophyta.

Quebracho. Quince. Quinoa. Radish. Ramie. Ranales. Rape. Raspberry. Rauwolfia. Red alder. Redtop grass. Redwood. Rhamnales. Rhizobiaceae. Rhodobacteriaceae. Rhodophyta. Rhubarb. Rosales. Rose. Rubber tree. Rubiales. Rutabaga. Rye. Saccharomycetales. Safflower. Saffron. Sage. Salicales. Salmonella. Sandalwood. Santalales. Sapindales. Sarraceniales. Sarsaparilla. Sassafras. Schistostegiales. Schizogoniales. Schizomycetes. Schizophyceae. Scitaminales. Selaginellales. Sequoia. Shigella. Siderocapsaceae. Siphonales. Siphonocladales. Sisal. Sourwood. Soybean. Spear-mint. Sphaerioidaceae. Sphaeropsidales. Sphagnales. Sphagnobrya. Sphenophyllales. Sphenopsida. Spirillaceae. Spirochaetales. Sporobolomycetales. Spruce. Staphylococcus. Stilbellaceae. Strawberry. Streptococcus. Streptomycetaceae. Strophanthus. Strychnos. Sundew. Sunflower. Sweetgum. Sycamore. Synanthales. Tangerine. Tea. Tetraphidiales. Tetrasporales. Thallophta. Thiobacteriaceae. Timothy. Tobacco. Tomato. Tracheophyta. Triuidales. Tuberculariaceae. Tubiflorales. Tulip tree. Tung tree. Tupelo. Turmeric. Turnip. Ulotrichales. Uvales. Umbellales. Uredinales. Urticales. Ustilaginales. Vanilla. Varnish tree. Vegetable ivory. Venus' flytrap. Vetch. Virales. Volvocales. Walnut. Wheat. Willow. Yeast. Zythiaceae.

For the economic and practical aspects of these groups see AGRICULTURE. For the use of certain plants related to the control of soil erosion, water and land range management see CONSERVATION. For fossil groups see PALEOBOTANY. For structure see PLANT ANATOMY. For environmental considerations of many of these groups see PLANT ECOLOGY. For diseases see PLANT PATHOLOGY. For functional aspects see PLANT PHYSIOLOGY.

## Plant pathology

Abaca. Alfalfa. Apricot. Ascomycetes. Bacteria. Barley. Basidiomycetes. Bean. Cabbage. Cacao. Cherry. Clover. Coconut. Coffee. Corn. Cotton. Cow-

pea. Cucumber. Currant. Eumycetes. Flax. Fruit (tree) diseases. Fungi Imperfecti. Grass crops. Jute. Lettuce.

Melon growing. Millet. Mycology. Oats. Onion. Ornamental plant. Pea. Peach. Peanut. Phycomycetes. Plant disease. Plant disease control. Plant virus. Plum. Potato. Irish. Potato, sweet. Ramie. Raspberry. Rhizosphere. Rice. Rust (microbiology). Sisal. Smut (microbiology). Soil microbiology. Soil sterilization. Sorghum. Soybean. Squash. Strawberry. Sugar beet. Sugar cane. Sunflower. Tobacco. Tree. Turnip. Wheat. Wood decay. Yeast.

For other articles on the effects of plant disease see AGRICULTURE. For articles on the effect of plant disease on the animal and plant communities see ANIMAL ECOLOGY; PLANT ECOLOGY. For more articles on techniques in studying plant disease see MICROBIOLOGY.

## **Plant physiology**

Abscission. Acetyl phosphate. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Alanine. Amino acids. Amylase. Arginine. Ascorbic acid. Asparagine. Aspartic acid. Auxin. Biological oxidation. Biotin. Carbohydrate. Carbohydrate metabolism. Carotenoid. Chlorophyll. Coenzyme. Creatine-creatinine. Cysteine. Cytine. Cytochrome. Dextrin. Digitoxigenin. Diphosphopyridine nucleotide (DPN). Enzyme. Enzyme inhibition. Ergosterol.

Folic acid. Fructose. Galactose. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glutamic acid. Glutamine. Glutelin. Glycine. Glycolipid. Hydroponics. Inositol. Inulin. Isoleucine. Krebs cycle. Lactase. Leucine. Lipid. Lipid metabolism. Lysine. Metabolism. Methionine. Monosaccharide. Niacin. Nucleic acid. Nucleoprotein. Oligosaccharide. Pantothenic acid. Peptide. Phenylalanine. Phosphate. Photochemistry. Photoperiodism in plants. Photosynthesis. Plant, mineral nutrition of. Plant, minerals essential to. Plant, water relations of. Plant fermentation. Plant growth. Plant hormones. Plant metabolism. Plant movements. Plant physiology. Plant respiration. Plant trans-location (organic solutes). Polysaccharide. Porphyrin. Prolamine. Proline. Protein. Raffinose. Reproduction, plant. Riboflavin. Seed germination. Serine. Sphingolipid. Steroid. Sterol. Sucrose. Thiamine. Threonine. Transamination. Triglyceride. Triphosphopyridine nucleotide (TPN). Tryptophan. Tyrosine. Valine. Vernalization. Vitamin.

For applications in farming see AGRICULTURE; for applications in tree and lumber management see FORESTRY; for applications in various plant tissues see PLANT ANATOMY; for applications in the study of plant relations to each other and the environment see PLANT ECOLOGY.

## **Plant taxonomy**

Arboretum. Botanical gardens. Classification, biological. Herbarium. Paleobotany. Plant classifica-

tion. Plant keys. Plant kingdom. Plant names. Plant taxonomic literature. Plant taxonomy. Taxonomy.

For specific plants and plant groups see PLANT KINGDOM.

## **Production engineering**

See INDUSTRIAL AND PRODUCTION ENGINEERING.

## **Propulsion**

Aerodynamic wave drag. Afterburner. Aircraft engine. Aircraft engine, reciprocating. Aircraft engine performance. Aircraft fuel. Aircraft propulsion. Air-cushion vehicle. Automotive engine. Benzene. Borane. Boron fuel. Butane. Ceramic technology. Cesium. Chemical fuel. Diesel engine. Diesel fuel. Distillate fuel. Electromagnetic propulsion. Energy sources. Engine. Explosion and explosive. Fire. Flight. Flight science. Fossil fuel. Fuel. Fuel gas. Fuel gas supplements. Gas dynamics. Gas turbine. Gasoline. Hydrazine. Hydrocarbon. Hydrogen. Hypersonic flight. Internal combustion engine. Interplanetary propulsion. Ion. Ion propulsion. Jet flow. Jet fuel. Jet propulsion. Jet velocity. Kerosine. Liquified petroleum gas (LPG). Locomotive. Marine engine. Metal-base fuel. Missile. Nozzle. Nuclear aircraft propulsion. Nuclear rocket. Octane. Oxidation process. Oxygen. Power. Propellant. Propeller, air. Propulsion. Pulse jet. Radiation pressure. Refractory. Rocket engine. Rocket-sled testing. Skin friction. Solar energy. Solar engine/Sonic barrier. Specific fuel consumption. Specific impulse. Steam engine. Streamline flow. Streamlining. Subsonic flight. Superaerodynamics. Supercharger. Supersonic flight. Thermodynamic principles. Thermodynamic processes. Throttled flow. Thrust. Toluene. Turbine. Turbine propulsion. Turbolan. Turbojet. Turboprop. Turboram jet.

For drive mechanisms see MECHANICAL ENGINEERING.

## **Psychology, physiological and experimental**

Abnormal behavior. Adrenal gland. Aggression. Agnosia. Amnesia. Aphasia. Apraxia. Astereognosis. Audiometry. Behavior, ontogeny of. Behavior and heredity. Behavioral psychophysics. Black. Blindness. Body rhythm. Chemoreception. Color. Color vision. Convulsive disorders. Cretinism. Cutaneous sensation. Deafness. Defecation. Delusion. Effector systems. Electroconvulsive shock. Electroencephalography. Emotion. Endocrine mechanisms. Ephaptic transmission. Epilepsy. Equilibrium, biological. Extrasensory perception (ESP). Freudianism. Frustration. Gray.

Hallucination. Headache. Hearing. Hibernation. Hoarding behavior. Homeostasis. Hormone. Human engineering. Hunger. Huntington's chorea. Hypnosis. Hypothermia. Hysteria. Instinctive behavior. Insulin shock. Intelligence. Involutional



melancholia. Itch. Kinesthetic sensation. Learning theories. Lie detector. Loudness. Manic depressive psychosis. Mechanoreceptors. Memory. Mental deficiency. Methods study. Migratory behavior. Mongoloid idiocy. Motivation. Motor systems. Muscular system. Nervous system. Neurophysiology. Neurosis. Noise, acoustic. Obsessive compulsive reaction. Operator training. Ovary. Pain, cutaneous. Pain, deep. Pancreas. Paralysis agitans. Paranoia. Paranoid state. Parathyroid gland. Paresis, general. Paresthesia. Perception. Periodicity in organisms. Personality theory. Phenylpyruvic oligophrenia. Phobic reaction. Phonoreception. Photoreception. Pitch. Posture, regulation of. Problem solving (psychology). Psychic energizer. Psychoacoustics. Psychoanalysis. Psychogalvanic response. Psychology, physiological and experimental. Psychopharmacologic drugs. Psychophysical methods. Psychosis. Psychosurgery. Psychotherapy. Psychotomimetic drug. Reflex, conditioned. Reflex, unconditioned. Reproductive behavior. Reticular formation (brain). Schizophrenia. Senile dementia. Sensation. Sense, chemical. Sensory learning. Sight. Sleep. Smell. Somatization. Somesthesia. Speech. Stereognosis. Stress (psychological). Synaptic transmission. Taste. Taxis. Temperature senses. Thermoregulation. Thirst. Thyroid gland. Tickle. Tone (music and acoustics). Touch. Tranquilizer. Urination. Verbal learning. Vision. Wage incentives. White. Work measurement.

For more information on the chemistry of various physiological processes see *BIOCHEMISTRY*; for articles on cellular physiology see *CYTOLOGY*; for aspects related to inheritance of traits see *GENETICS*.

## Sanitary engineering

Amebiasis. Analytical chemistry. Ascariasis. Bacillary dysentery. Cholera vibrio. Colorimetric analysis. Enteric bacilli. Escherichia. Extraction. Flame photometry. Flocculation. Fluorimetric analysis. Gas analysis. Gravimetric analysis. Imhoff tank. IMViC test. Infectious disease control. Infectious disease transmission. Ion exchange. Nephelometric analysis. Polarographic analysis. Precipitation, chemistry. Qualitative chemical analysis. Radiometric assay. Refractometric analysis. Sampling techniques. Sanitary engineering. Schistosomiasis. Septic tank. Sewage. Sewage collection systems. Sewage disposal. Sewage solids. Sewage treatment. Spot-test analysis. Stoichiometry. Titration, amperometric. Titration, conductimetric. Titration, potentiometric. Typhoid fever. Volumetric analysis. Water analysis. Water microbiology. Water pollution. Water softening. Water treatment. Water-borne disease.

See also *BACTERIOLOGY*; *MEDICAL MICROBIOLOGY*; *MICROBIOLOGY*.

## Serology

See *MEDICAL MICROBIOLOGY*.

## Soil

Agricultural soil and crop practices. Agriculture (drainage). Clay. Clay minerals. Dust storm. Erosion. Evapotranspiration. Fertilizing. Forest soil. Humus. Irrigation of crops. Paleosol. Pedology. Plant, water relations of. Regolith. Soil. Soil balance, microbial. Soil conservation. Soil mechanics. Soil microbiology. Soil microorganisms. Soil mineral (microbial utilization). Soil phosphorus (microbial cycle). Soil sterilization. Soil sulfur (microbial cycle). Terracing (agriculture). Weathering processes.

For a consideration of parent materials and other factors which influence the development of soils see *GEOLOGY (MINERALOGY AND PETROLOGY)*; *GEOLOGY (SURFICIAL AND HISTORICAL)*; *HYDROLOGY*.

## Solid-state physics

Absorption (electromagnetic radiation). Acceptor atom. Adhesion, molecular. Adiabatic demagnetization. Alloy. Alloy structures. Alnico. Amorphous solid. Anelasticity. Angstrom. Anisotropy (physics). Antiferromagnetism. Atomic clock.

Band theory of solids. Barium titanate. Bloch theorem. Boltzmann constant. Boltzmann transport equation. Bose-Einstein statistics. Brillouin zone. Cathodoluminescence. Ceramic technology. Cermet. Chemical binding. Chemiluminescence. Cohesion (physics). Color centers. Conduction (heat). Conduction band. Contact potential difference. Contact rectifier. Controlled rectifier. Coordination number. Corbino disk. Corbinotron. Cryosar. Cryotron. Crystal. Crystal defects. Crystal growth. Crystal optics. Crystal structure. Crystallization. Crystallography. Curie temperature, magnetic. Curie-Weiss law. Cyclotron. Dark current. Diamagnetism. Diffraction. Diffusion in solids. Diode, semiconductor. Domain (crystallography). Donor atom.

Elasticity. Electrical conductivity of metals. Electroluminescence. Electron diffraction. Electron emission. Electronegativity. Energy level (quantum mechanics). Esaki tunnel diode. Exciton. Exclusion principle. Fermi-Dirac statistics. Ferromagnetic garnets. Ferrimagnetism. Ferrite. Ferrite devices. Ferroelectrics. Ferromagnetism. Fluorescence. Franck-Condon principle. Free-electron theory of metals. Galvano-magnetic effect. Gel. Germanium. Germanium diode. Grain boundaries (metallurgy). Ground state. Gyration. Gyromagnetic effect. Gyromagnetic ratio. Hall effect. Harmonic motion. Holes in solids. Hypersomes. Hysteresis, thermal. Infrared detector. Insulator, electric. Interface of phases. Intermetallic compounds. Ionic crystals. Iron-silicon alloys. Isomorphism (crystallography). Isotropy (physics). Junction diode. Junction transistor. Kerr effect. Kinetic theory of matter. Kronig-Penney model. Langevin function. Larmor precession. Laser. Lattice constant. Lattice vibrations. Liesegang rings. Light amplifier. Light panel. Low-

temperature physics. Luminescence. Luminous paint.

Madelung constant. Magnetic materials. Magnetic relaxation. Magnetic resonance. Magnetic thin films. Magnetism. Magnetization. Magnetocaloric effect. Magnetoresistance. Magnetostriction. Maser. Matthiessen's rule. Mean free path. Meissner effect. Metal. Metallic-disk rectifier. Metamict state. Molecular electronics. Morphotropism. Mössbauer effects. Mu metal. Neutron diffraction. Oscillator. Parmagnetism. Parametric amplifier. Permalloy. Phonon. Phosphorescence. Photoconductive cell. Photoconductivity. Photodiode. Photoelasticity. Photoelectric devices. Photoelectricity. Photoluminescence. Photolysis (photochemistry). Photon. Phototransistor. Photovoltaic cell. Photovoltaic effect. Piezoelectric crystal. Piezoelectricity. Plasticity. Point-contact diode. Point-contact transistor. Polarization of waves. Polymorphism (crystallography). Potential barrier. Potentials (physics). Probability in physics. Pyroelectricity.

Quantum (physics). Quantum mechanics. Quantum statistics. Quantum theory, nonrelativistic. Radiation damage (inanimate materials). Reciprocity, principle of. Refractory. Relaxation time (electrons). Resilience. Resistivity, electrical. Rheology. Rochelle salt. Selenium. Semiconductor. Semiconductor rectifier. Silicon diode. Single crystal. Sintering. Solar battery. Solid solution. Solid-state chemistry. Solid-state physics. Specific heat of solids. Stationary state. Statistical mechanics. Sublimation. Superconductivity. Surface-barrier transistor. Surface phenomenon. Susceptibility, magnetic. Temperature. Thermal expansion. Thermal stress. Thermoanalysis. Thermoluminescence. Thermomagnetic effects. Titanate. Transistor. Traps in solids. Tunnel diode. Tunneltron. Twinning (crystallography). Ultrasonics. Umklapp process. Valence band. Varactor. Whiskers (crystal). Wiedemann-Franz law. Wigner-Seitz method. Work function (electronic). X-ray crystallography. X-ray diffraction. X-ray powder methods. X-unit. Zener diode.

## Sound

See ACOUSTICS.

## Space technology

Aerodynamic center. Aerodynamic force. Aerodynamic wave drag. Aerodynamics. Afterburner. Aircraft fuel. Air-velocity measurement. Aluminum. Apogee. Astronautical engineering. Astronautics. Astronomical coordinate systems. Astronomical geophysics. Astronomy. Astrophysics. Automatic astronavigation. Ballistic missile. Ballistic range. Ballistics, exterior. Borane. Boron fuel. Boundary-layer flow. Center of gravity. Center of mass. Centrifugal force. Centripetal force. Ceramic technology. Chemical fuel. Communications satellite. Cosmic rays. Ducted flow. Electromagnetic propulsion. Energy conversion. Escape velocity. Explo-

sion and explosive. Flight. Flight dynamics. Flight science. Fuel. Gas dynamics. Gravitation. Hydrazine. Hydrogen. Hypersonic flight. Impulse (mechanics). Interplanetary propulsion. Interstellar matter. Interstellar space. Ion propulsion. Jet propulsion. Latitude, astronomical. Longitude, astronomical. Launching pad complex. Mach number. Magnesium. Magneto-hydrodynamic power generator. Metal-base fuel. Meteorological satellites. Minitrack. Missile. Model theory. Nose cone. Nuclear aircraft propulsion. Nuclear rocket. Optical tracking. Orbital motion. Parachute. Propellant. Propulsion. Radiation. Radiation pressure. Reentry. Rocket. Rocket astronomy. Rocket engine. Rocket-sled testing. Rocket staging. Rudder, aircraft. Satellite, artificial. Satellite, navigation by. Similitude. Solar energy. Solar engine. Solar radiation. Space. Space biology. Space flight. Space navigation and guidance. Space power systems. Space probe. Space technology. Spacecraft structures. Specific fuel consumption. Specific impulse. Stabilizer. Stellar magnetic field. Supersonic flight. Tail assembly. Thermal stress. Thermionic power generator. Thermoelectric power generator. Thrust. Trajectory. Transonic flight. Turbine propulsion. Van Allen radiation. Weightlessness.

For articles on aeronautics see AERONAUTICAL ENGINEERING. For astronomical bodies see ASTRONOMY. For articles on the upper atmosphere see GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY.

## Strength of materials

See ENGINEERING MECHANICS.

## Systematics

See ANIMAL SYSTEMATICS and various articles in INVERTEBRATE ZOOLOGY; PALEONTOLOGY; VERTEBRATE ZOOLOGY. See also PLANT TAXONOMY and various articles on plant groups in PALEOBOTANY.

## Systems engineering

See CONTROL SYSTEMS ENGINEERING.

## Taxonomy

See ANIMAL SYSTEMATICS; PLANT TAXONOMY; and various articles in INVERTEBRATE ZOOLOGY; PALEONTOLOGY; VERTEBRATE ZOOLOGY; the various plant groups in PALEOBOTANY.

## Theoretical physics

Antimatter. Antineutron. Antiproton. Boltzmann constant. Boltzmann statistics. Boltzmann transport equation. Bose-Einstein statistics. Brownian movement. Causality. Clock paradox. Compton effect. Conservation of mass. De Broglie wavelength. Degeneracy (quantum states). Eigenfunction. Eigenvalue. Energy. Energy level (quantum mechanics). Excited state. Exclusion principle. Fermi-Dirac statistics. Field theory, classical. FitzGerald-Lorentz contraction. Fourth dimension. Gravitation. Gravity. Ground state. Inertia of energy. Kinetic theory of matter. Mathematical physics. Matrix

mechanics. Mean free path. Metastable state. Mossbauer effect. Perturbation (mathematics). Perturbation (quantum mechanics). Photon. Planck's constant. Potentials (mathematics). Potentials (physics). Probability in physics. Quantization. Quantum (physics). Quantum electrodynamics. Quantum field theory. Quantum mechanics. Quantum numbers. Quantum statistics. Quantum theory. Nonrelativistic. Quantum theory, relativistic. Relativistic electrodynamics. Relativistic mechanics. Relativity. Rest mass. Ritz's combination principle. Schrodinger's wave equation. Space time. Spinor. Stationary state. Stationary wave. Statistical mechanics. Superposition, principle of. Symmetry laws (physics). Theoretical physics. Transformation theory, quantum. Uncertainty principle. Unified field theories. Wave mechanics. Wave packet.

## Thermodynamics

Activity (thermodynamics). Adiabatic process. Aerothermodynamics. Aircraft engine performance. Beattie-Bridgeman equation. Boltzmann constant. Boltzmann statistics. Boyle's law. Brayton cycle. Carnot cycle. Charles' law. Chemical energy. Combustion. Compressible flow. Conservation of energy. Crocco's equation. Dalton's law. Diesel cycle. Energy. Enthalpy. Entropy. Free energy. Gibbs function. Heat. Heat balance. Heat exchanger. Heat pump. Internal energy. Isentropic process. Isobaric process. Isometric process. Isothermal process. Otto cycle. Polytropic process. Potentials (physics). Propulsion. Rankine cycle. Refrigeration cycle. Specific heat. Statistical mechanics. Thermoanalysis. Thermochemistry. Thermodynamic cycle. Thermodynamic principles. Thermodynamics (chemical). Turbine propulsion. Van der Waals equation. Vapor cycle. Virial equation. Work.

See also PHYSICAL CHEMISTRY.

## Ultrasonics

See ACOUSTICS.

## Vertebrate zoology

Acipenseriformes. Actinopterygii. Aepvornithiformes. Agnatha. Albatross. Alligator. Allothetia. Alpaca. Amniiformes. Amniota. Amphibia. Amphicoela. Anamnia. Anguilliformes. Anomocoela. Anseriformes. Anteater. Antelope. Apodiformes. Apterygiformes. Archaeornithes. Armadillo. Artiodactyla. Auk. Aves. Avocet. Baboon. Badger. Barracuda. Bass. Bat. Batrachoidiformes. Bear. Beaver. Belontiiformes. Beryciformes. Bird. Bison. Blackbird. Blacksnake. Bluebird. Bluefish. Boa. Bobcat. Bobolink. Bullsnake. Bunting. Bushmaster. Caiman. Camel. Canary. Caprimulgiformes. Capybara. Cardinal. Caribou. Carnivora. Carp. Casuariiformes. Cat. Catbird. Catfish. Cattle. Caudata. Cephalaspidomorphi. Cetacea. Chamaeleon. Chamois. Charradriiformes. Chat. Chelonia. Chickadee. Chicken. Chimpanzee. Chinchilla. Chipmunk. Chiroptera. Chuckwalla. Chondrichthyes. Chordata. Ciconiiformes. Civet. Clupeiformes. Cobra. Cockatoo. Cod-

fish. Coelacanthiformes. Coliiformes. Columbiiformes. Cony. Coof. Copperhead. Coraciiformes. Coral snake. Cormorant. Cottonmouth. Cougar. Cowbird. Coyote. Crane (zoology). Craniata. Crappie. Creeper. Croaker. Crocodile. Crocodilia. Crossbill. Crossopterygii. Crow. Cryptobranchioidea. Cuckoo. Cuculiformes. Curlew. Cyclostomata (Chordata). Cypriniformes. Cyprinodontiformes. Dace. Darter. Deer. Dermoptera. Diatrymiformes. Dickcissel. Dinornithiformes. Diplasiocoela. Dipnoi. Dog. Dogfish. Dolphin. Donkey. Dove. Duck. Eagle. Echeneiformes. Edentia. Eel. Elasmobranchii. Elephant. Elk. Eutheria. Falconiformes. Fer-de-lance. Ferret. Finch. Fish. Fisher. Flamingo. Flicker. Flounder. Flycatcher. Flying fish. Fox. Frigate bird. Frog. Gadiformes. Galliformes. Gallinule. Gannet. Gar. Carter snake. Gasterosteiformes. Gaviiformes. Gecko. Gila monster. Giraffe. Gnathostomata. Gnu. Goat. Gobiesociformes. Goldfish. Goose. Gopher. Gorilla. Grackle. Grebe. Green snake. Grosbeak. Grouse. Gruiformes. Guinea hen. Guinea pig. Gull. Guppy. Gymnophiona. Hamster. Hawk. Hellbender. Heron. Herring. Hippopotamus. Hog. Hog-nosed snake. Holocephali. Horned toad. Horse. Hummingbird. Hyracoidea. Ibis. Ibis. Ichthyornithes. Insectivora. Jaguar. Jav. Junco. Kangaroo. Killdeer. Killifish. Kingbird. Kingfisher. Kinglet. King snake. Kiwi. Koda. Lagomorpha. Lamprey. Lampridiformes. Lark. Lemming. Leopard. Lion. Lizard. Llama. Loon. Lophiiformes. Lovebird. Lungfish. Luvu. Mackerel. Maggie. Mammalia. Manatee. Marsupialia. Martin. Mastacembeliformes. Meantes. Menhaden. Metatheria. Mink. Minnow. Mockingbird. Mole. Mongoose. Monkey. Monotremata. Moose. Mouse. Mud puppy. Mule. Multituberculata. Musk ox. Muskrat. Myctophiformes. Myxiniiformes. Neognathae. Neornithes. Nighthawk. Notacanthiformes. Nutcracker. Nut-hatch. Ocelot. Odontognathae. Opisthocoela. Opossum. Orangutan. Oriole. Osteichthyes. Osteolepiformes. Ostrich. Otter. Ovenbird. Owl. Penda. Pantoheria. Parrot. Partridge. Passeriformes. Peacock. Peccary. Pegasiformes. Pelecaniiformes. Pelican. Penguin. Perch. Perciformes. Percopsiformes. Perissodactyla. Petromyzontiformes. Pewee. Phalarope. Pheasant. Phoebe. Pholidota. Piciiformes. Pickerel. Pisces (zoology). Pleuronectiformes. Podicipitiformes. Polypteriformes. Porcupine. Porpoise. Prairie chicken. Prairie dog. Primates. Proboscidea. Procellariiformes. Procoela. Proteales. Prototheria. Psittaciformes. Ptarmigan. Pteraspodomorphi. Puffin. Python. Quail. Rabbit. Raccoon. Rail. Rajiformes. Rat. Rattlesnake. Ratites. Raven. Ray. Redstart. Reindeer. Reptilia. Rheiformes. Rhinoceros. Rhynchocephalia. Roadrunner. Robin. Rodentia. Sable. Saccopharyngiformes. Salamander. Salamandroidea. Salientia. Salmon. Sandpiper. Sapsucker. Sarcopterygii. Sculpin. Sea horse. Sea lion. Seal (zoology). Semionotiformes. Shad. Shark. Sheephead. Shiner. Shrew. Shrike. Sirenia. Skink. Skunk. Sloth. Smelt. Snake. Snipe. Sparrow. Sphenisciformes. Squaliformes.

Squamata. Squid. Squirrel. Starling. Stickleback. Strigiformes. Struthioniformes. Sturgeon. Sucker. Sunfish. Swallow. Swan. Swift. Symmetrodonta. Synbranchiformes. Taeniodonta. Tanager. Tapir. Tarpon. Tern. Terrapin. Tetraodontiformes. Tetrapoda. Theria. Thrasher. Thrush. Tiger. Tillodontia. Tinamiformes. Titmouse. Toad. Towhee. Trogoniformes. Trout. Tubulidentata. Tuna. Turkey. Turnstone. Turtle. Vertebrata. Vicuna. Viero. Vulture. Walleye. Walrus. Warbler. Water snake. Waxwing. Weasel. Whale. Whippoorwill. Whitefish. Wolf. Wolverine. Woodchuck. Woodcock. Woodpecker. Wren. Yak. Zebra. Zebu. Zetiformes.

For classification schemes and methods *see* ANIMAL SYSTEMATICS; for fossil vertebrates *see* PALEONTOLOGY.

## **Virology**

Actinophage. Adenovirus. Animal virus. Antibody. Antigen. Antigen-antibody reaction. Antitoxin. Arboviral encephalitis. Avian leukosis. Bacteria. lysogenic. Bacteriophage. Bioassay. Cat scratch disease. Chickenpox and shingles. Cold, common. Coliphage. Complement (serum). Complement-fixation test. Conglutination. Coxsackie virus. Culture, embryonated egg. Culture, tissue. Disease carrier. ECHO virus. Encephalitis, equine. Enterovirus. Epidemiology. Exanthem subitum. Fever. German measles. Hemadsorption viruses. Herpes simplex. Hypersensitivity. Immunity. Inclusion blennorrhea. Inclusion bodies (virus). Infection. Iytic. Infectious disease control. Infectious disease

transmission. Infectious mononucleosis. Infective dose 50. Influenza. Interferon. Keratoconjunctivitis (epidemic). Louping-ill. Lymphocytic choriomeningitis. Lymphogranuloma venereum. Lysin. Lytic reaction. Measles. Meningitis. Microscope, electron. Microscope, fluorescence. Microtobiotes. Molluscum contagiosum. Mouse viral leukemias. Mumps. Myxomatosis, infectious (rabbits). Myxovirus. Neutralization reaction (antibody). Neuromyasthenia, epidemic. Newcastle disease. Nucleic acid. Papillomatosis, infectious (rabbit). Parainfluenza. Pathogen (soil). Phlebotomus fever. Plant disease. Plant virus. Pneumonitis. Poliomyelitis. Polyoma virus. Psittacosis. Public health. Rous sarcoma. Salivary gland virus disease. Serology. Smallpox. Soil balance, microbial. Soil microbiology. Tick fever. Colorado. Trachoma. Tumor viruses. Virus gastroenteritis, epidemic. Virales. Virulence. Virus. Virus chemoprophylaxis. Virus infection, latent. Virus interference. Wart. West Nile fever. Yellow fever.

## **Zoology**

Zoology.

*See also* ANIMAL ANATOMY; ANIMAL ECOLOGY; ANIMAL PATHOLOGY; ANIMAL SYSTEMATICS; BIOCHEMISTRY; BIOPHYSICS; COMPARATIVE PHYSIOLOGY; CYTOLOGY; EVOLUTION; GENETICS; GENERAL PHYSIOLOGY; GROWTH AND MORPHOGENESIS; HISTOLOGY; INVERTEBRATE ZOOLOGY; PALEONTOLOGY; PHYCOTOLOGY; PHYSIOLOGICAL AND EXPERIMENTAL; VERTEBRATE ZOOLOGY.